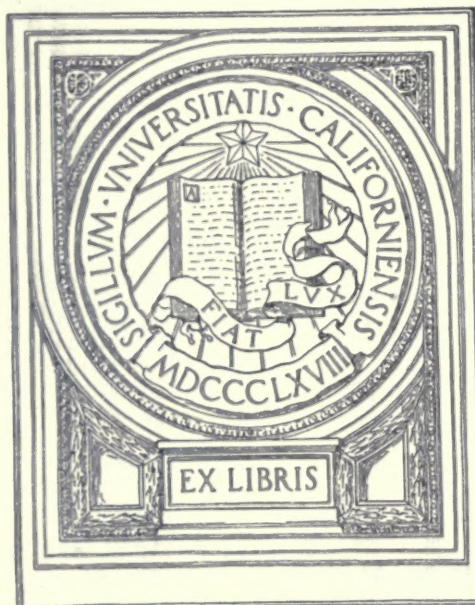




EX LIBRIS

REPORTS

OF

EXPLORATIONS AND SURVEYS,

TO

ASCERTAIN THE MOST PRACTICABLE AND ECONOMICAL ROUTE FOR A RAILROAD

FROM THE

MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

MADE UNDER THE DIRECTION OF THE SECRETARY OF WAR, IN

1853-6,

ACCORDING TO ACTS OF CONGRESS OF MARCH 3, 1853, MAY 31, 1854, AND AUGUST 5, 1854.

VOLUME VIII.

WASHINGTON:
A. O. P. NICHOLSON, PRINTER.
1857.

IN THE HOUSE OF REPRESENTATIVES—FEBRUARY 14, 1855.

Resolved, That there be printed, for the use of the House, ten thousand copies of the reports of surveys for a railroad to the Pacific, made under the direction of the Secretary of War, embracing the report of F. W. Lander, civil engineer, of a survey of a railroad route from Puget's Sound, by Fort Hall and the Great Salt lake, to the Mississippi river; and the report of J. C. Frémont, of a route for a railroad from the headwaters of the Arkansas river into the State of California; together with the maps and plates accompanying each of said reports necessary to illustrate them.

Attest:

J. W. FORNEY,

Clerk of the House of Representatives of the United States.

THIRTY-SECOND CONGRESS, SECOND SESSION—CHAPTER 98.

SECT. 10. *And be it further enacted*, That the Secretary of War be, and he is hereby authorized, under the direction of the President of the United States, to employ such portion of the Corps of Topographical Engineers, and such other persons as he may deem necessary, to make such explorations and surveys as he may deem advisable, to ascertain the most practicable and economical route for a railroad from the Mississippi river to the Pacific ocean, and that the sum of one hundred and fifty thousand dollars, or so much thereof as may be necessary, be, and the same is hereby, appropriated out of any money in the treasury not otherwise appropriated, to defray the expense of such explorations and surveys.

Approved March 3, 1853.

THIRTY-THIRD CONGRESS, FIRST SESSION—CHAPTER 60.

Appropriation: For deficiencies for the railroad surveys between the Mississippi river and the Pacific ocean, forty thousand dollars.

Approved May 31, 1854.

THIRTY-THIRD CONGRESS, FIRST SESSION—CHAPTER 267.

Appropriation: For continuing the explorations and surveys to ascertain the best route for a railway to the Pacific, and for completing the reports of surveys already made, the sum of one hundred and fifty thousand dollars.

Approved August 5, 1854.

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GENERAL ENLISTED ROUTES

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

WAR DEPARTMENT.

GENERAL REPORT

UPON

THE ZOOLOGY

OF THE

SEVERAL PACIFIC RAILROAD ROUTES

WASHINGTON, D. C.

1857.

1271

LETTER TO CAPTAIN HUMPHREYS, TOPOGRAPHICAL ENGINEERS.

SMITHSONIAN INSTITUTION, *Washington, April 7, 1857.*

SIR: During the first organization of the parties for the survey of a railroad route to the Pacific, application was made to the Smithsonian Institution, by the officers in charge, for instructions and suggestions in reference to the development of the Natural History of their respective lines. These were cheerfully furnished as in accordance with the objects of an establishment intended for the increase and diffusion of knowledge. The specimens in zoology, as collected, were transmitted, from time to time, to the Institution and properly preserved, until the return of the parties. A series of special reports was prepared by the naturalists of the expeditions, but as these were necessarily disconnected and incomplete, it was deemed desirable to furnish a general systematic report upon the collections as a whole, and for this purpose the materials were entrusted to competent individuals, the necessary drawings being executed by a skilful artist within the walls of the Institution.

I now transmit the first part of the general report—on the Mammals—which has been prepared by Professor Baird, Assistant Secretary of this Institution, and I trust the character of the work is such as to merit the approbation of the Department as well as to advance the interests of science.

Very respectfully, your obedient servant,

JOSEPH HENRY,

Secretary Smithsonian Institution.

Captain A. A. HUMPHREYS, *Topographical Engineers.*



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INTRODUCTION.

INTRODUCTION.

GENERAL SKETCH OF LINES EXPLORED.

Shortly before the close of the session of Congress in March, 1853, an appropriation of \$150,000 was made to defray the expenses of the survey of the various routes along which it was supposed that a railroad might be constructed from the Mississippi river to the Pacific ocean. For this purpose six parties were organized by the War Department for the survey of four main routes ; and in a short space of time they were in the field. All the parties were fitted out in the most complete manner ; the natural history apparatus and material prepared under the direction of the Smithsonian Institution, which also furnished the necessary instructions as to the objects most important to be collected. In its efforts to secure the assignment to these parties of persons capable of making collections and observations in natural history, it was met by the hearty co-operation of the War Department, through the heads of the different expeditions, and Captain Humphreys, in charge of the Pacific Railroad Office.

It is, of course, not necessary in this place to give an account of the *personnel* of these parties, nor any detailed history of their routes or results ; but, as explaining the origin and objects of the present report, a brief sketch of each, with a statement of the naturalists accompanying them, will be required. The parties organized in 1853 were as follows :

1. LINE OF THE 47TH PARALLEL, UNDER GOVERNOR I. I. STEVENS.—This portion of the survey, placed under the command of Governor I. I. Stevens, was most extensive in its organization, and first in the field. It was divided into two quite distinct parties, one proceeding across the country to the Pacific, the other starting at the Columbia river and moving towards the east. The first division, immediately in charge of Governor Stevens, left St. Paul (where it was principally fitted out) on the 8th of June, 1853, and proceeded directly to Fort Union, at the mouth of the Yellowstone. Here it was joined by Lieutenant Donelson, who had embarked in the Fur Company's boat at St. Louis. From Fort Union the party proceeded along the Missouri to the mouth of Milk river, and up this stream to Fort Benton ; thence across the mountains to the Mission of St. Mary's ; thence to Fort Colville, by the way of the Cœur d'Alene ; and finally to Vancouver and Olympia. Collateral lines were also traversed at the same or different times by Lieutenant Mullan, Lieutenant Donelson, Lieutenant Saxton, and others.

The western division of the line, under command of Captain G. B. McClellan, proceeded from New York to San Francisco ; thence to Vancouver, and next explored both sides of the Cascade mountains for some distance northward. The party met Governor Stevens at Fort Colville, and continued thence to the northern boundary line.

The main party, under Governor Stevens, was accompanied by Doctor George Suckley, United States army, as surgeon and naturalist, although collections were also made by Lieutenants Donelson and Mullan. Doctor Suckley's chief points in collecting were St. Paul's, Bois

de Sioux, Lake Miniwakan, Fort Union, Milk river, Fort Benton, and St. Mary's Mission, and afterwards, during nearly four years' residence on the western coast, at Forts Steilacoom, Vancouver, Dalles, and Boisé, as also at Port Townsend, and other points on Puget's Sound. A very valuable collection made between St. Paul's and Fort Union, on the Missouri, was lost in the Ohio river.

The party under Captain McClellan was accompanied by Doctor J. G. Cooper, as surgeon and naturalist. The principal localities where collections were made by him were Vancouver, various points in the Cascade range, Spokane plain, and subsequently Shoalwater bay, where he resided several years. On his return to the east he also made collections at San Francisco and Santa Clara, California.

Doctor John Evans, who accompanied Governor Stevens as geologist, also made collections in zoology.

2. LINE OF THE 38TH, 39TH, AND 41ST PARALLELS, UNDER CAPTAIN J. W. GUNNISON AND CAPTAIN E. G. BECKWITH.—This party was first organized under command of Captain Gunnison, with Dr. Schiel, surgeon and geologist, F. Kreuzfeldt, botanist, and R. N. Kern, topographer. It started from Camp Shawnee Reservation on the 20th of June, and proceeded up the Sandy Hill fork of the Kansas; thence across to the Arkansas and up to the Apispah. They next passed over to the Trincheres, next to the Huerfano, and over the mountains to Fort Massachusetts, by the El Sangre de Cristo pass. They next went through the Coochetope pass to Grand River of the Colorado, and finally, by way of the Wahsatch pass, nearly to Sevier lake. Here a portion of the party, including Captain Gunnison, Mr. Kern, and Mr. Kreuzfeldt, was surprised by a band of Pah Uths and all killed. The command of the expedition then devolved upon Captain Beckwith, who proceeded to Salt Lake City, and thence in the spring of 1854, by way of Fort Reading, to California, and back to Washington.

The principal points where collections were made by this party were the Arkansas river, the Huerfano, the El Sangre de Cristo, Sahwatch, and Coochetope passes, Green river, Salt Lake City, and various points on the route to San Francisco.

3. LINE OF THE 35TH PARALLEL, UNDER CAPTAIN A. W. WHIPPLE.—This party was almost as extensive in its organization and operations as that under Governor Stevens. For a time there were two divisions; one under Captain Whipple, with Mr. H. B. Möllhausen as artist and zoologist, and Doctor Bigelow, surgeon and botanist; the other under Lieutenant J. C. Ives, accompanied by Dr. C. B. Kennerly, as surgeon and naturalist. The party under Captain Whipple went from Fort Smith mainly up the Arkansas river, and across the Llano Estacado, via Anton Chico, to Albuquerque. Here it was met by Lieutenant Ives' division, which had proceeded by way of New Orleans, Indianola, and San Antonio to El Paso, by the usual mail route, and thence north to Albuquerque. From Albuquerque the united party went to the Little Colorado by way of Zuñi; next, by way of the San Francisco mountains, to Bill Williams' fork; down this stream to the Colorado; then up the Mohave, and across to San Francisco.

The principal points where collections were made by this party were Indianola, San Antonio, Fort Clark, El Paso, Fort Conrad, various localities on the Arkansas, Zuñi, Little Colorado, San Francisco mountains, Bill Williams' fork, the Colorado river, and the Mohave. A very large collection of new and rare mammals and other animals in alcohol was lost on the Isthmus of Panama by an express company.

4. CALIFORNIA LINE, UNDER LIEUTENANT R. S. WILLIAMSON.—This party, accompanied by Dr.

A. L. Heermann, as surgeon and naturalist, and W. P. Blake, as geologist, proceeded to San Francisco by sea, where it was fitted out. Passing up the San Joaquin and the Tulare valley, they also explored the region about Walker's pass, the Tejon and other passes, and portions of the Mohave and Colorado rivers.

5. LINE OF THE 32D PARALLEL, WEST, UNDER LIEUTENANT J. G. PARKE.—After the completion of Lieutenant Williamson's survey, Lieutenant Parke, who had accompanied him as assistant, proceeded by way of Warner's ranch to Fort Yuma, and up the Gila to the Pimo and Maricopa villages, thence by way of Tucson, the Copper Mines, (Fort Webster,) and Doña Ana, to El Paso. From this point the party returned to Washington by way of San Antonio.

6. LINE OF THE 32D PARALLEL, EAST, UNDER CAPTAIN J. POPE.—This party started from El Paso, and proceeded in almost a straight line eastward to Preston, on Red river, passing through the Guadalupe mountains. The Pecos was crossed at the mouth of Delaware Creek, and the Llano Estacado traversed for a distance of 125 miles.

The most important collections of this party were made on the Llano Estacado, and on the headwaters of the Brazos and Colorado. Captain Pope also brought with him collections made on the Mimbres and at Fort Thorn, by Dr. T. C. Henry, U. S. Army.

The preceeding lines are those organized or detailed for duty in the year 1853. Subsequent parties, however, were from time to time sent out by the War Department, either to verify old routes or to determine new ones; of which the following are those yielding natural history results:

7. CALIFORNIA AND OREGON LINE, UNDER LIEUTENANT WILLIAMSON.—This expedition, accompanied by Lieutenant Abbot, as assistant, and Dr. J. S. Newberry, as geologist, and naturalist, proceeded to San Francisco by sea, in May, 1855, and, after its full organization, commenced the exploration of the Cascade mountains, on both sides, to the Columbia river. The principal points on the route where collections were made, were Fort Reading, Klamath lake, Cascade Mountains, Canoe creek, Pit river, Des Chutes river, the Willamette, &c.

8. LINE OF THE 32D PARALLEL AND CALIFORNIA, UNDER LIEUTENANT J. G. PARKE.—This exploration, accompanied by Dr. Antisell, as surgeon and geologist, was chiefly occupied in a revision of the lines over which Lieutenant Parke had passed in 1853 and 1854.

In addition to the collections of the expeditions mentioned above, there have been embodied in this report the results of several other explorations made under the War Department, and more or less intimately connected with the solution of the great western railroad problem. These are as follows:

9. THE EXPLORATION OF THE LLANO ESTACADO, IN 1854-'56, BY CAPTAIN POPE.—This expedition was occupied in the western part of Texas and New Mexico in ascertaining the possibility of obtaining water in the deserts of the west by means of artesian borings. The collections were made chiefly at Indianola, Guadalupe bottom, San Antonio, Devil's river, the crossing of the Pecos at Delaware creek, Waco Tanks, El Paso, Doña Ana, &c.

10. THE EXPLORATION OF THE UPPER MISSOURI AND YELLOWSTONE, BY LIEUTENANT G. K. WARREN. This exploration was made in 1856, and extended along the Missouri river to a point eighty miles above the mouth of the Yellowstone, and up the Yellowstone to Powder river. Collections were made at all points along the route. Dr. F. V. Hayden acted as surgeon, geologist, and naturalist to the party.

11. CONSTRUCTION OF WAGON ROAD FROM FORT RILEY TO BRIDGER'S PASS, IN 1856, BY LIEUTENANT F. T. BRYAN.—This party was accompanied by W. S. Wood, as collector and naturalist,

and proceeded from Fort Riley to Bridger's Pass, and back by a different route for a portion of the distance.

12. EXPLORATIONS OF RED RIVER, BY CAPTAIN R. B. MARCY, AND AIDED BY CAPTAIN G. B. McCLELLAN, ACCOMPANIED BY DR. G. G. SHUMARD, as surgeon and naturalist.

The remaining less strictly official collections from the west, used in this report, were made chiefly by the following parties and persons:

COLONEL ALFRED VAUGHAN, Indian agent, and Dr. F. V. HAYDEN, in 1854 and 1855.— Their explorations were of the Missouri river from Council Bluffs to Fort Benton, the Yellowstone, for a considerable portion of its extent, and various points between the Platte and Upper Missouri, including the Black hills.

Lieut. W. P. TROWBRIDGE, on the Pacific coast, at San Diego, San Miguel, Monterey, San Francisco, Bodega, Humboldt Bay, Port Orford, Astoria, and Cape Flattery. His collections were made while engaged on tidal observations for the Coast Survey, assisted by Messrs. Andrew Cassidy, Jas. Wayne, and T. A. Szabo.

RICHARD D. CUTTS, also on Coast Survey duty. Collections made chiefly near San Francisco.

Dr. JOHN F. HAMMOND, U. S. A., at Fort Reading and San Diego.

E. SAMUELS, at Petaluma, Tomales Bay, and the Redwoods, California. Mr. Samuels was sent out by the Smithsonian Institution and the Boston Natural History Society.

Major G. H. THOMAS, at Fort Yuma, California. In making his collections, Major Thomas was assisted by Lieut. DUBARRY, Lieut. R. E. PATTERSON, and Dr. R. O. ABBOTT, U. S. A.

Dr. W. S. KING, U. S. A., at San Diego.

Dr. J. L. LECONTE, at various points in California; A. S. TAYLOR, at Monterey, California; and A. J. GRAYSON, at San José; Dr. W. O. AYRES, at San Francisco; Dr. C. C. BOYLE, on the American river.

Lieut. NUGEN, in the Cascade Mountains; Dr. POTTS, U. S. A., at Fort Jones; Dr. W. F. TOLMIE, at Fort Nisqually.

Dr. SWIFT, U. S. A., at Fort Chadbourne, Texas; Dr. ANDERSON, U. S. A., at Fort McKavit; Dr. L. A. EDWARDS, U. S. A., in Texas and Arkansas; Dr. S. W. CRAWFORD, U. S. A., at Fort Bliss, Texas; GUSTAVUS WURDEMAN, on the coast of Texas.

Dr. W. A. HAMMOND, U. S. A., at Fort Riley, aided by L. X. de VESEY; Lieut. COUCH at Fort Leavenworth; Dr. WM. HAMMOND, at Fort Kearney; Capt. S. VAN VLIET, at Fort Laramie and at Brownsville, Texas; Major J. H. CARLETON, at Fort Laramie; ALEXANDER CULBERTSON, as also MESSRS. EDWARD T. DENIG and FERDINAND CULBERTSON, of the American Fur company, and THADDEUS A. CULBERTSON, on the Upper Missouri; J. S. BOWMAN, during several trips across the plains from St. Louis to San Francisco.

Dr. J. F. HEAD, U. S. A., at Fort Ripley, Minn., aided by the Rev. S. W. MANNEY. CHARLES CAVILEER, at Pembina, Minn.

Major E. S. SIBLEY, at Fort Union, New Mexico.

A more detailed account of the collections and expeditions referred to above will be found in the reports of the Smithsonian Institution.—(Sixth to the eleventh, 1851–1856.) A notice of the collections from the eastern portions of the United States, used for purposes of comparison, will also be found in the same series.

The very rich collections made by the United States and Mexican Boundary Survey in Texas, New Mexico, and California, are described in detail in its report, which also embraces notices of the results of the explorations in Texas and northern Mexico, by Dr. Berlandier, Mr. John

Potts, Major Rich, and Lieut. Couch. Incidental mention of these is also made occasionally in the present volume, wherever necessary to complete the indications of geographical distribution.

The collections of all the government parties just mentioned were transmitted, from time to time, to the Smithsonian Institution, and were there properly cared for until the return of the several expeditions. They were then placed in the hands of the naturalists selected to elaborate them, and the necessary drawings prepared, within its walls, under the direction of the Institution, to which, also, was committed the general supervision of the engraving and printing of the plates. Every facility has been furnished by the War Department, through Captain Humphreys, in charge of the Pacific Railroad Office, and the heads of the different expeditions, for bringing the results properly before the world.

PART I.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

M A M M A L S :

BY SPENCER F. BAIRD.

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION.

WASHINGTON, D. C.
1857.

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PREFACE.

The present report is intended to embrace a systematic account of all the species of North American mammals collected or observed by the different parties organized under the direction of the War Department for ascertaining the best route for a railroad from the Mississippi river to the Pacific ocean. It was originally proposed to furnish a separate report in detail, on the collections of each party, but a consideration of the fact that, with scarcely an exception, almost every species was found on two or more lines of survey, and thus not peculiar to any one expedition, led to an abandonment of the first intention. It was considered to be worse than useless to repeat the same descriptions and details over and over again, while, at the same time, under the circumstances, it would have been difficult to say in what report any particular article could be best placed. As, too, the interest of North American zoology depends not merely on the character of the species, but also on their generic and family affinities, as well as on their relationships to latitude and longitude, climate, soil, elevation, &c., it would have been impossible to do justice to the subject by cutting up the report into several isolated portions without any special connexion as parts of a systematic whole.

At the same time, however, as it was desirable to present a picture of the zoological character of the several routes, as well as to show what each party accomplished, and as many very important notes of habits and local peculiarities were made by the naturalists of the different lines, it would have been clearly an act of injustice to these gentlemen as well as to their chief officers to merge all their results into one common report. For these and other reasons it was finally determined that there should be prepared one general report on the entire collections of the railroad surveys, to consist solely of the technical description of the families, genera and species, and of such remarks as might be necessary to show their place in the systems, each species to be preceded by its synonymy, and followed by an enumeration of all the specimens collected, so arranged in tables as to show their geographical distribution.

In addition to this general report, however, special reports by the naturalists of each line were also to be prepared and published, to embrace the systematic and vernacular names of their species, with a list of the specimens collected. To these special reports were to be confined all the biographies of the animals seen, all notices of their habits, peculiarities, and distribution, as observed and recorded during the route. In order, that there might be no misconception of the species referred to, it was concluded to give a short diagnosis of each with a reference to the page of the general report where the purely zoological details might be found more at length.

The present report, therefore, is the first of the series of general reports referred to, to be followed as soon as practicable by the remainder of the Vertebrata. The special reports on the zoology of each line of survey will be found in connexion with the other reports belonging to their respective parties, and, in their full notices of the life of our western animals, possess

a general and popular interest far greater than can attach to the present account of mere zoological and technical details.

The large size of this report on the mammals collected by the railroad parties is owing to several causes. In the first place, the amount of new or little known material obtained was extraordinarily great. The summary of the species at the beginning of the systematic list hereafter presented, will show that very many entirely undescribed animals were procured, and that of a large number of others, previously little known, the specimens were sufficient to furnish many new and interesting details of characters, both external and internal.

As, too, the object in calling for complete reports from the several parties was not merely to show the actual results of the several expeditions, but likewise to ascertain the general character of the western territories, I have not hesitated to include in this work all such materials derived from officers stationed at military posts, and other persons elsewhere in the west, as fell under my notice.

In view of the large amount of new or little known species at hand, in the preparation of the present report, sometimes embracing entire genera and even families, it soon became evident that none of the published descriptions of the old and standard species were sufficiently minute and detailed to furnish the necessary means of comparison. With the discovery of forms very closely allied to or intermediate between those already known, the descriptions of the latter on record did not show sufficiently in what the differences consisted. It became necessary, therefore, to re-describe, as far as they could be procured, all such species, which, in fact, proved finally to be nearly all previously known. The present monograph of American mammals has, in the end, grown out of the necessities referred to.

It will be sufficiently evident that, without the extraordinarily rich and full collection of North American mammals belonging to the Smithsonian Institution, the monographs and comparisons of species, in the present report, could not have been prepared. Independently of the specimens brought in by the Pacific Railroad surveying parties, the series in its museum, from other sources, was found to embrace nearly all the previously known species, and many entirely new ones.

I have also made free use of the collections and library of the Philadelphia Academy of Natural Sciences, for which every facility has been furnished in its hall. The examination of the specimens collected by Townsend, and described by Dr. Bachman, has contributed to settle some quite doubtful points, while in some rare or very costly works of its unequalled natural history library I have been enabled to verify many references which would otherwise have remained uncertain.

I regret not to have been able to examine any of the types of the new species of Audubon and Bachman, as presented by the latter gentleman to the Charleston museum. The rules of that establishment do not permit specimens to leave its hall, and it was not possible to visit it during the preparation of this report.

I have endeavored to make all acknowledgments of aid from systematic writers in the body of the report, although it may be well to mention here that much use has been made throughout of the works and articles of Wagner, Waterhouse, Gray, Brandt, Burmeister, Keyserling and Blasius, Giebel, Richardson, Agassiz, Engelmann, and others, as enumerated in the synonymy and list of authorities. To the labors of Messrs. Audubon and Bachman, however, either singly or collectively, are acknowledgments especially due for whatever facilities may have previously existed for the preparation of a report on American mammals. The necessity or propriety of such a report is only to be found in the fact that, when the crowning work of these gentlemen, "The

Viviparous Quadrupeds of North America," was prepared, the materials at their command were far less extensive than have been at mine, and that many species which they could only examine in the museum of London, Paris, Berlin, and Leyden, are now to be found in the Smithsonian collection in a profusion of specimens of the most satisfactory and perfect character.

An apology is necessary for the delay which has taken place in the completion of the general reports on the zoology of the Pacific Railroad surveying parties. This has arisen from the fact that, from the first organization of these expeditions, in the spring of 1853, nearly to the present time, one or more has been in the field, and engaged in fresh examinations; so that until all the specimens expected were received, the general systematic account of zoological results could not conveniently be prepared. The examination of the materials was actually commenced early in 1855, and many of the articles written in that year and in 1856. With the continuous accession of additional specimens, it became finally necessary to re-write, alter, or extend all that had been prepared prior to the present year (1857.) It is to this that the frequent want of uniformity is due, the time allowed not being sufficient in many cases to permit the re-working of the whole matter. The measurements of the specimens were at first made in inches and lines, but that of hundredths was finally adopted; it is to this fact that the presence of the two different divisions of the inch is attributable, it not being convenient or possible to make the measurements conform throughout, as would have been desirable.

It is, perhaps, unnecessary to state that the matter of the present report is entirely original throughout, the few cases in which extracts from other authors are made being so indicated. With very few exceptions, all the references in the synonymy have also been personally made and verified. Where this was not possible, the synonym is enclosed between quotation marks.

In explanation of the too frequent occurrence of typographical errata in the body of this report, it is proper to state that, owing to various circumstances, the work was necessarily passed through the press with a rapidity probably unexampled in the history of natural history printing, allowing very little opportunity for that critical and leisurely examination so necessary in correcting a work of the kind. For most of the time the proof has been furnished and read at the rate of twenty-four to thirty-two pages per day; nearly 400 pages having been set up, read, and printed during the first half of July alone. The same cause has also interfered with the preservation of perfect uniformity of arrangement and detail throughout. In some cases, accidents to the form while on the press have caused the loss or transposition of letters, words, or paragraphs; as, among others, the exchange of characters of Orders VIII and IX, on page 1, referred also to on page 625. For excuse of errors in the use of technical terms, in the formation and inflection of scientific names, and for all other shortcomings, the writer can only throw himself upon the kind indulgence of his readers, partly in consideration of the fact that, owing to the urgent necessity for a speedy completion of the volume, no time was allowed for any revision of the manuscript as a complete work, nor, indeed, of its separate portions, and that for much of the time the preparation of the manuscript was only a few hours in advance of its delivery to the compositor.

A few words in explanation of the plan adopted in preparing the articles of the present report may not be out of place. I have usually made the entire detailed description of the species from one particular specimen, (often indicating it by number,) mentioning afterwards the variations presented from this type by the others before me. The specific diagnoses alone contain a combination or selection from the characters of several specimens.

The numbers attached to the specimens, as enumerated, are those which they bear in the

Smithsonian Museum Catalogues. Each class of animals has its separate catalogue and succession of numbers, from 1 upwards, in this series, the same number being never used twice for different objects in its class, and thus constituting an essential part of the specimen. There is also a special catalogue of the osteological collections. Thus, the skin of a mammal will have one number, and its skull, if separated, another; each specimen having both numbers attached, its own as numerator of a fraction. Thus, when a skin is labelled or entered $\frac{421}{1149}$, it is to be understood that 421 is its number, as entered in the catalogue of skins (or entire specimens in alcohol,) while 1149 is the number of the skull, as entered in the osteological catalogue. The skull itself would in this case be marked $\frac{1149}{421}$.

The column of "original numbers" embraces those attached to specimens in the field by collectors. These are always retained as being referred to in the field notes of the different parties.

The measurements have, in all cases, been made in English inches,¹ divided either into lines or twelfths, or into 100ths. All the skulls, and in most cases the smaller skins, have been measured with dividers or callipers. The measurements of the body have been made to the insertion of the tail into the rump, or nearly to the very base of the caudal vertebræ; the animal usually with the head, body, and tail extended into the same straight line, avoiding, as far as possible, all curvature.

Where measurements are recorded as made before skinning, they are, in most cases, to be understood as having been furnished by the collector.

For the sake of illustrating more fully the character of the species described in the present Report, I have prepared the three lists as follows:

The first list is that of the higher groups characterized in the following pages.

The second list contains all the species of mammals found in North America north of Mexico, that I have had an opportunity of examining, while preparing the present work, together with a few that belong to the northern provinces of the last mentioned State. These are inserted, as very probably existing within the limits of the United States, even though not yet detected. The indications of geographical distribution are chiefly those furnished by the specimens before me, although I have occasionally given statements in this respect from Audubon, Bachman, and Richardson. I have not pretended to define, with critical accuracy, the complete range of the species, the facts on record not being sufficient for the purpose.

The third list embraces the species which have not fallen under my notice. Some of these have little claim to a place in the fauna of North America north of Mexico, while others are, in all probability, the same as those mentioned in the first list. A few are unquestionably additional and good species; especially such as *Sorex fimbripes* and *palustris*, *Putorius nigripes*, *Arctomys prinosus*, *Thomomys talpoides*? *Arvicola borealis*, *drummondii*, *richardsonii*, and *xanthognathus*, and some others.

¹ The English inch used is about equal to 11.26 French lines, .9383 French inches, or to 25.40 millimetres. On the other hand, the French inch is equal to 1.0657 English inches; the French line to .0888 English inches, and the millimetre to .03937 English inches. The French metre is equivalent to 39.37 English inches, or 3.28 feet.

The following table will serve to indicate the additions in the list to the known species of North American mammals, as compared with the latest general work on the subject :

Species described here, as new, for the first time.....	35
Species described in 1855, from the same collection.....	17
Total of new species in the Smithsonian collection not mentioned by Audubon and Bachman	52
Recognized species previously described, not mentioned by Audubon and Bachman.....	18
Total of North American species additional to the list of Audubon and Bachman.....	70

The entire number of species mentioned by Audubon and Bachman in the *Quadrupeds of North America*, exclusive of varieties, is 197, of which about 160 were figured, the remainder consisting either of species previously described by the authors, but not procurable for purposes of illustration, or else copied from others, to render their work complete.

The total number of species of North American mammals represented in the Smithsonian collection is very nearly 220.

WASHINGTON, D. C., *July* 20, 1857.

I. TABLE OF THE HIGHER GROUPS.

Order.	Page.	Family.	Page.	Sub-family.	Page.	Genus.	Page.	Sub-genus.	Page.	Species examined and notified.	Species not identified.
I. EAPACIA.											
1. Sub-order.											
Insectivora	2	1. Soricidae	7	Soricinae.....	7	1. Neosorex	11			1	...
						2. Sorex.....	13			12	4
						3. Blarina	36			7	...
		2. Talpidae.....	57			4. Scalops.....	58	Scalops.....	58	2	1
								Scapanus.....	58	2	...
						5. Condylura	71			1	...
						6. Urotrichus.....	76			1	...
						7. Felis	81			5	...
						8. Lynx	89			4	...
2. Sub-order.						9. Canis.....	104			2	...
Carnivora	78	3. Felidae.....	80			10. Vulpes	121	Vulpes	121	4	...
								Urocyon	121	2	...
		4. Canidae	102	Lupinae.....	103					1	...
				Vulpinae.....	121	11. Bassaris	147			2	...
		5. Viverridae... ..	146			12. Mustela.....	149			10	1
		6. Mustelidae.....	148	Martinae	148	13. Putorious.....	159			1	...
						14. Gulo.....	181			2	...
				Lutrinae	183	15. Lutra.....	184			1	...
						16. Enhydra.....	189			1	...
				Melinae	190	17. Mephitis.....	191	Thiosmus	191	4	1
								Mephitis.....	192	2	...
		7. Ursidae.....	206			18. Taxidea	201			2	...
						19. Procyon	207			2	1
						20. Ursus	216			3	...
II. MARSUPIATA.....	230	8. Didelphidae...	231			21. Didelphys.....	232			2	...
III. RODENTIA.....	235	9. Sciuridae	240	Sciurinae	240	22. Sciurus.....	243			12	6
						23. Pteromys	286			4	...
						24. Tamias.....	291			4	...
						25. Spermophilus ..	304	Otospermophilus...	305	5	1
								Colobotis	306	9	...
						26. Cynomys	329			2	...
						27. Arctomys	338			2	2
				Myoxinae	350					1	...
				Castorinae.....	350	28. Aplodontia	350			1	...
						29. Castor.....	355			1	...
						30. Castoroides.....	363			1	...
		10. Saccomyidae ..	365	Geomyinae	366	31. Geomys.....	368			5	...
						32. Thomomys.....	388			7	1
				Saccomyinae	405	33. Dipodomys.....	406			3	2
						34. Perognathus....	416	Perognathus.....	417	4	...
								Cricetodipus.....	418	2	...
		11. Muridae.....	427	Dipodinae.....	428	35. Jaculus	429			1	...
				Murinae	436	36. Mus	436			4	...
						37. Reithrodon.....	447			4	1
						38. Hesperomys ...	453	Hesperomys	458	13	1
								Onychomys.....	458	1	...
								Oryzomys	458	1	...
						39. Neotoma.....	486			6	...
						40. Sigmodon.....	501			2	...
				Arvicolinae	507	41. Arvicola.....	509	Hypudaeus	515	1	...
								Hemiotomys.....	515	10	11
								Chilotus.....	516	1	...
								Pedomys	517	3	...
								Pitymys	517	1	...
						42. Myodes.....	554	Synaptomys	558	1	...
								Myodes	554	2	...
						43. Fiber.....	560			1	...

TABLE OF THE HIGHER GROUPS—Continued.

[illegible]

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INTRODUCTORY REMARKS.

At the present day there is considerable difference among systematic zoologists as to the characters of the primary divisions among the Mammals, and the points upon which their classification should be based. For my present purposes, however, I adopt the following arrangement:

A.—UNGUICULATA, (with claws.)

1. TEETH OF THREE KINDS.

a. *Mammæ two, on the breast.*

I. *Quadrumana*. Limbs free; hind feet acting as hands.

II. *Cheiroptera*. Arms provided with a naked membrane for flying.

b. *Mammæ more than two: on the belly.*

III. *Rapacia*. *Mammæ* free.

IV. *Marsupialia*. *Mammæ* contained in a pouch.

2. TEETH OF LESS THAN THREE KINDS.

V. *Rodentia*. Canine teeth alone wanting.

VI. *Edentata*. Incisor teeth, sometimes canines and molars, wanting.

B.—UNGULATA, (with hoofs.)

VII. *Solidungula*. With one hoof.

VIII. *Pachydermata*. With two hoofs.

IX. *Ruminantia*. With more than two hoofs.

C.—PINNATA, (with fins.)

X. *Pinnipedia*. With four fins.

XI. *Cetacea*. With two fins.

Of the above orders all are found in North America except the *Quadrumana*; and although the *Solidungula*, represented by the horse, do not now exist as native animals, yet there are abundant evidences of the existence of the horse as an extinct genus, as well as of other forms of the order.

Although large collections of *Cheiroptera* or bats were made by the surveys, I do not propose to work them up in the present report, owing to lack of time necessary to do it properly. The same may be said of the *Pinnipedia* and *Cetacea*.

ORDER I.

RAPACIA.

Animals having three kinds of teeth : incisors, canines, and molars. Mammæ free, ventral. Thumbs not opposable to the fingers.

The rapacious animals, consisting of two very distinct orders, *Carnivora* and *Insectivora*, are readily distinguished by the above characters from the other great groups of the mammalia with which they are most nearly allied. The want of an opposable thumb and of flat finger nails, together with the ventral position of the mammæ, distinguish them from the *Quadrumana*; the absence of the elongated finger frame work, with its elastic membrane, from the bats. From the *Marsupialia* they may be known by the absence of marsupial bones and pouch, and by their free teats.

As a general rule the condyle of the lower jaw, with its glenoid cavity are transverse, allowing but little motion except in a vertical direction. The brain has distinct convolutions; the posterior lobes are short. The stomach is simple, and the intestinal canal short.¹

The rapacious animals are well distributed over the world, North America having a large share of the species. They nearly all live on animal food, and are, in many cases, specially adopted to the capture of particular forms. Some always kill their own prey, others take it as furnished by other agencies.

The species all fall within one or other of the two orders, *Insectivora* and *Carnivora*.

SUB-ORDER.

INSECTIVORA.

Incisors and canines variable; molars prismatic, with acute cusps; feet with claws, plantigrade; digits not elongated; thumb not opposable; clavicles complete.

In the great advances made within the last few years in our knowledge of the true relationships of many genera of mammals, few orders have experienced greater changes in systematic arrangement than the *Insectivora*. Comparatively few of its subdivisions being found represented in North America, it becomes necessary for American students to depend mostly upon European works on the subject for a knowledge of the limits and classification of the order, and I have therefore considered myself fortunate, in the recent appearance of a masterly though hasty sketch of the *Insectivora*, by Dr. J. A. Wagner, in the fifth volume of his supplement to Schreber's *Säugethiere*, published in 1855.

In Wagner's arrangement, the order is divided into the following five families:

I. DERMOPTERA. Body margined with a hairy membrane; mammæ, pectoral. Genus: *Galeopithecus*. Indian Archipelago.

II. SCANDENTIA. General appearance that of the squirrels, but with an attenuated, elongated muzzle, distinct canines, and closed orbital ring. Genus: *Cladobates*, India.; *Ptilocercus*, Borneo; *Hylomys*, Java.

III. SORICIDÆ. Mouse like in appearance; muzzle much elongated; feet regular or normal; canines not distinguishable, or spurious; bony orbital annulus wanting, or imperfect.

Genera: *Rhyncocyon*, Mosambique; *Gymnura*, East Indies; *Macroscelides*, Africa; *Sorex*, Old World and North America, wanting in South America and New Holland. Sub-genera: *Crossopus*, *Sorex* (*Brachysorex*, *Anotus*), *Crocidura*, *Myosorex*; *Solenodon*, St. Domingo and Cuba; *Myogale*, eastern and western Europe.

IV. TALPIDÆ. External ears wanting; limbs short; hand broad, provided with stout fossorial claws.

Genera: *Urotrichus*, Japan; *Scalops*, North America; *Rhinaster*, North America; *Talpa*, Europe and Asia; *Chrysochloris*, South Africa.

V. ACULEATA. Back covered with spines or bristles; feet normal; tail short or wanting. Species confined to the Old World.

Genera: *Centetes*, Madagascar; *Ericulus*, Madagascar; *Echinogale*, Madagascar; *Erinaceus*, Old World.

The first two families have been variously placed: the *Dermoptera* among the bats, (and even the monkeys,) from which, however, their hairy interfemoral membrane, resembling that of the flying squirrel, at once separates them; from the Aberrant *Quadrupana* they are readily distinguished. The *Scandentia* have been distributed in different families. It is only with the *Soricidæ* and *Talpidæ*, however, that we have to do as inhabitants of the American continent.

Pomel, in an article on the distribution of *Insectivora*, published in the *Bulletin de la Soc. Géologique de France*, deuxième série, VI, Nov. 1848, 56, makes the following arrangement of the order, to include both recent and fossil forms.

I. SPALACOGALIENS.

1. TALPIENS.

- Talpa. Confined to old world.
- Mogera. Japan.
- Geotrypus. Fossil.
- Astromycter. North America.
- Galeospalax. Fossil.
- Hyporyssus. Fossil.
- Scalops. One in Mexico ; two, United States.
- Scapanus. Two, North America ; more boreal than Scalops.

2. MYGALIENS.

- Chrysochloris. Africa.
- Solenodon. Antilles.
- Mygale. Europe.
- Plesiosorex. Fossil.
- Mysarachne. Fossil.
- Urotrichus. Japan.

3. SORICIENS.

- Talpasorex. (Not of Lesson.) Atlantic States of North America.
- Sorex.
- Corsira. India, Europe, Liberia ; 3 sp. in North America.
- Blarina. 3 sp., North America.
- Otisorex. One sp., United States.
- Hydrogale. One sp., United States.
- Galemys.
- Brachysorex. 2 sp., North America.
- Crossopus. 1 sp., North America ; Europe, India, Japan.
- Pachyura. Old world.
- Musaraneus.
- Cryptotis. United States.
- Myosorex. Africa.
- Crocidura. Old world ; one, North America.

II. GALECHINIENS. Confined to old world.

1. GLISORICIENS.

- A. Hylogales.
- Sorexglis.
- Oxygomphius.
- B. Dipogales.
- Macroscelides.

2. ECHINOGLIENS.

A. Anachantes.

Echinogale.

Hylomys.

Galerix.

Gymnura.

B. Herissons.

Erinaceus.

3. CENTETIENS.

Echinops.

Ericulus.

Centetes.

Echinodes.

As far as relates to the North American insectivora, the preceding table is by no means accurate in its indications. Thus, while it gives eight genera, as found in the United States, two of them, *Crossopus* and *Crocidura*, do not belong there at all; while *Otisorex* and *Corsira* are synonymes of *Sorex*, and *Brachysorex*, and probably *Cryptotis* belong to *Blarina*. I do not know what species he refers to under the genera of *Talpasorex* and *Hydrogale*.

FAMILY.

SORICIDAE.

As stated previously, the family of shrews, in its most extended sense, is characterized by a general mouse or rat-like appearance, muzzle elongated and tapering; ear, with a distinct concha; feet normal, or the anterior smaller than the posterior, by which character of ears and feet it is readily distinguished from the *Talpidae*. The soft hair separates it at once from the *Aculeata*.

The skeleton presents from 12-14 pairs of ribs; 6-8 vertebræ, without ribs; 3-5 sacral, and 14-28 caudal vertebræ. The tibia and fibula are united, the clavicles thin, the pubic arch closed. The stomach is simple, the coecum wanting or very large, the penis long; there are peculiar glands on the side of the body, or the base of the tail.

Of the various genera comprising the family, none are found in North America except those belonging to the *Soricinae*, and the only other new world representative is *Solenodon*, from Cuba. This is as large as a rat, with 40 teeth, and a naked tail. The hair is quite bristly. *Rhynchocyon* has large ears, stiff hairs, and four-toed feet. *Gymnura* is of large size, with rounded ears, and naked ears and tail. *Macroscelides* has very long hind feet and tail.

SUB-FAMILY SORICINAE.

The shrews of all parts of the world are distinguished by an elongated and pointed muzzle; external ears, with two inner lobes, formed by the development of the antitragus and helix; feet, five-toed, each with a distinct claw; the fore feet but little broader, if at all, than the hinder; the tail variable in length. They are spread over the northern hemisphere, some species ranging very far to the north, and, although the smallest of known mammals, sustaining the rigors of the severest winters. Species have been found in Southern and Central Africa, Asia, the East Indies, and the whole of Europe; hitherto, the region of the Rio Grande, of Texas, has proved the American limit to the south; no well authenticated specimens having been brought from South America. It is true, indeed, that J. E. Gray mentions, in the Proceedings of the Zoological Society for 1844, having received two shrews from Coban, in Central America, which he names *Corsira tropicalis* and *C. temlyas*, but he has, as yet, published no accounts of them, not even their specific characters.

The skull of the shrews has several peculiarities. It is long and narrow, much pointed anteriorly; compressed at the orbits, and in some species having a distinct crest along the crown. The malar bone is wanting, and there is no zygomatic arch. There is a deep fossa on the inner side of the coronoid process.

The teeth of the shrews vary from 28 to 32, although some American authors give as many as 34 and 36, probably erroneously. There are two very large incisor teeth in each jaw, directed nearly horizontally forward; the upper pair much curved and forming a hook; the lower straighter, and usually with the trenchant upper edge more or less lobed. In the posterior part

of the upper jaw there are four large teeth, the posterior much the smallest, each with numerous points. Between these and the large incisors are three, four, or five simple and much smaller teeth; the last or posterior of these are usually very small. These teeth are conical, and have sometimes a small pointed tubercle on the inner side at the base. There are three multicuspid molars in the lower jaw, and between these and the incisors are two simple teeth.

The precise homologies of the teeth of the shrews have been a matter of much controversy, especially in regard to the number of true molars, and the nature of the teeth just back of the anterior incisors. The most reliable authorities concur in considering the formula to be: incisors $\frac{1-1}{1-1}$; premolars $\frac{3-3}{2-2}$ to $\frac{5-5}{3-3}$; molars $\frac{4-4}{3-3}$; less than the usual number of incisors in mammals, and the canines wanting entirely. The teeth between the multicuspid molars and the large anterior incisors are sometimes simply called anterior lateral teeth, by way of non-committal.

The concha is usually provided with two valves or flaps, the more effectually to close the meatus; one formed by the antitragus, the other by the helix.

The snout is extended some distance beyond the incisor teeth, and ends in a naked muffle with the nostrils pierced in the sides. The eyes are very minute, though usually discoverable on close examination. The ears are more or less distinct, except in the genus *Blarina* of J. E. Gray, where they are entirely concealed in the dried skin. The feet are nearly plantigrade, and usually naked beneath.

"The stomach of the shrews has the pyloric portion sometimes very short—sometimes much elongated; the cœcum is wanting; the liver is five lobed, with a gall bladder; the right lung four, the left, one lobed. The testicles and seminal vesicles are much swollen in the rutting season and lie in the abdominal cavity; the external genital apparatus in the male differing from that of the female only in the presence of the penis. The uterus is two horned; the female with 6-10 teats on the belly. There is a peculiar glandular apparatus on the side of the body, near the fore-legs, much developed in the male during the breeding season, but very slight, or wanting altogether, in the female or young.

"The *Soricinæ* first make their appearance in small number of species during the meiocene period, and continue through the diluvial epoch to the present time, without material change of form."¹

The food of the shrews consists chiefly of insects, worms, and mollusks, but they are capable of attacking or destroying small vertebrates, and readily devour each other. They are very voracious, and require a large amount of animal food. They are nocturnal, and more or less aquatic. They do not hibernate, but go about in the coldest weather. The young are born blind and naked.

The shrews constitute a very natural group, embracing many species, and have been the subject of much critical examination on the part of authors, especially of Wagler, Nathusius, Duvernoy, J. E. Gray, Bachman, and others. The Old World species are referable to three principal genera, the names of which I shall take from Wagler, as established by Nathusius and Wagler:

1. *CROSSOPUS*, Wagler. Teeth, 30; four premolars in the upper jaw; lower incisor with one tooth on the cutting edge; points of the teeth colored; feet large, ciliated, with bristly hairs on the margins; tail long, with a crest of long hairs on its lower side.

2. *SOREX*, Wagler. Ears distinct; teeth, 32; premolars, five; hinder hook of the upper

¹ Giebel, Allgemeine Zoologie, Säugthiere, 1855, 898.

incisor as large as the first of the five premolars; lower incisors dentate on the cutting edge; teeth colored at the points; tail moderately long, with the hairs all equal.

3. *CROCIDURA*, Wagler. Teeth, 28 or 30; the posterior hook of the upper incisor smaller than the first premolar; premolars, three or four; lower incisors with even cutting edge; all the teeth white; tail with longer scattered hairs interspersed indiscriminately among the short ones. Wagner, in Suppl. Schreb., V, 1855, 564, recognises a fourth genus, *Myosorex*, of Gray, as characterized by the dentition of *Crocidura*, three premolars, and the tail clothed with short hairs, without larger ones interspersed. The species, *M. varius*, is a native of S. Africa.

Of the above genera, but one, *Sorex*, (*Amphisorex*, of Duvernoy) is found in North America. *Crossopus* is represented by a genus differing in having a greater number of premolars and a differently constituted tail. Nothing essentially similar to *Crocidura* has been yet detected.

Of the American species there may be established three genera; two of them possibly divisible into two sub-genera, according as there are five premolars in the upper jaw or only four, this difference being accompanied by others of more or less importance. Their principal characteristics are as follows:

1. *NEOSOREX*. (n. g.) Ears rather short, partly furred on both surfaces, valvular, concha directed backwards; tail longer than the body (and head,) all the hairs of equal length, except at the tip; feet very large, with a fringe of ciliated hairs; skull very slender anteriorly, and elongated; upper anterior incisor with a second basal hook, and a small process on the inner side near the point. Two first premolars rather larger than the next.

2. *SOREX*. Ears large, valvular, partly furred on both surfaces, concha directed backwards; tail about as long as the body; the hairs of equal length, except at the tip; feet moderate, not fringed; skull slender anteriorly and elongated; upper anterior incisor with a second basal hook, and a small angular process on the inner side near the point; two anterior premolars somewhat larger than the next.

A. Feet large; teeth, $\frac{1-1}{1-1} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$.

B. Feet small; teeth, $\frac{1-1}{1-1} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$.

3. *BLARINA*. Ears small, not visible in nature; concha directed forwards, closing the meatus, its concavity entirely naked; tail as long as the head, or shorter; feet moderate, not ciliated; skull rather thick anteriorly, and shortened; upper anterior incisor without a basal hook, but only one acute lobe, nor has it any process on the inner side of the point; first two upper premolars lateral, much larger than the next.

A. Nearly uni-colored; teeth, $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$.

B. Bi-colored; teeth, $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$.

In the first division there are probably two species to be ranged: *Neosorex navigator* and *Sorex fimbripes* of Bachman. As stated, the genus differs from *Crossopus* in all respects except in the fimbriated or ciliated feet.

The genus *Sorex* embraces a large proportion of the American species, and is equivalent to the *Amphisorex* of Duvernoy, and *Otisorex* of Dekay, the latter established on the *O. platyrhinus*. The European species have invariably five premolars above, which diminish gradually from the first to the fifth. As will be seen, two species have but four premolars, this character accompanied by smaller feet. This group and the preceding have the upper jaw narrower and longer than the next, the greater elongation being due to the larger size of the third and fourth, or third, fourth, and fifth premolars; these are but little less than their predecessors, instead of

being abruptly smaller, in fact quite rudimentary. There is, however, a curious feature discernible in all the species of these first two genera from the Pacific region, namely: that the third premolar is smaller than the fourth, instead of being larger, or at least of equal size, as is the case in all the specimens examined from the country east of the Rocky mountains.

The greater elongation of the upper jaw is accompanied by a corresponding increase in the size of the lower, the number of teeth remaining the same. The lower incisor is pushed further forwards, so that its posterior extremity falls under the first premolar and half of the second, or at most only under the two premolars, while in *Blarina* the incisor is larger, stouter, and extends back to beneath the middle of the first molar.

The genus *Blarina* embraces the largest of the American species, one of them not inaptly termed *talpoides*. It may possibly bear division into two sub-genera of unequal number of premolars. Nothing analogous to this genus has been found in the Old World.

The following synopsis of the North American species described in this report may serve to render more intelligible the various subdivisions of the *Soricinae*.

SORICINAE.

NEOSOREX.....*navigator*.

SOREX.

A. Upper premolars five; teeth 32.

1. Third premolar smaller than the fourth and second.....*townsendii*.
vagrans.

suckleyi.

2. Third premolar larger than the fourth, smaller than or equal to the second.

a. Premolars not imbricated; points directed downwards.....*pachyurus*.

b. Premolars imbricated.....*forsteri*.

richardsonii.

platyrhinus.

3. Third and fourth premolars equal, and abruptly smaller than the first and second.

cooperi.

haydeni.

personatus.

B. Upper premolars four; teeth 30.....*hoyi*.

thompsoni.

BLARINA.

A. Upper premolars five; teeth 32.....*talpoides*.

brevicaudus.

carolinensis.

angusticeps.

B. Upper premolars four; teeth 30.....*cinereus*.

exilipes.

berlandieri.

NEOSOREX, Baird.

Ears rather short, partly furred on both surfaces; valvular.

Dental formula: Anterior incisors, $\frac{2}{2}$; lateral incisors and premolars, $\frac{5-5}{2-2}$; molars, $\frac{4-4}{3-3} = 32$; upper anterior incisor with a well defined hook at the base; lower one with two tubercles and a notch; first two upper teeth or premolars equal, and larger than the fourth, which exceeds the third and equals the basal hook of the anterior one; the fifth smallest; the first, and half the second lower lateral teeth placed above the base of the incisor; all the teeth colored at the tip; lower angular process of lower jaw very long and slender; tail as long, or longer than the body, with a terminal pencil; hairs uniform in length, except at tip; feet well developed, with a fringe of stiff bristles.

The genus bears a close resemblance to *Crossopus*, but differs in the much more slender muzzle, in having one more molar and two tubercles on the anterior lower incisor instead of one. With the feet similarly constituted, the tail is destitute of the median line of longer hairs. The very large and highly fringed feet distinguish it from *Sorex*. But one species, and that from the Pacific slope, has been determined, though it is possible that *S. fimbripes* of Bachman belongs to it.

NEOSOREX NAVIGATOR, Cooper, Mss.

SP. CHARACTER.—External ears small, hidden in the fur, which greatly exceeds them in length; longest hairs of the body a little over two lines long; feet and hands very large and broad; palms and soles, with the fingers and toes, margined by a fringe of ciliated bristles; the fore feet contained a little more than twice in the hinder, which are nearly as long as the skull; tail much longer than the head and body, (almost one-half longer,) with a distinct pencil at the tip; third lateral tooth smaller than the fourth; a very slight subterminal lobe to the anterior upper incisors; color above, dark sooty brown, mixed with hoary; beneath, greyish white; tail, silvery white beneath; length of head and body, $2\frac{1}{4}$; tail, 3.

Body rather thick and full; feet very large, broad, and long, entirely naked beneath, covered above with short, stiff hairs; the soles and palms margined with a fringe of stiff parallel ciliated bristles, longest on the soles; the fingers and toes all with a separate ciliation of shorter hairs; the soles are occupied by a pavement of crowded, minute scale-like tubercles, extending from the heel to the bases of the toes; hind feet about twice the length of the fore-feet; the ears are small, and in the dried skin very inconspicuous; the whiskers are numerous, the longest reaching back to the arms; the tail is longer than the body, tetragonal in the dried animal, a pointed pencil of hairs at the tip; the hairs elsewhere rather short, but close pressed and of uniform length everywhere.

The fur is long, and very full and soft; its color above and on the sides is a mixed, hoary and smoky brown; the hairs being lead color for most of their length from the base, grayish towards tip, then smoky brown, sometimes dark brown at the end. Intermixed are longer hairs, black, with grayish tips. The under parts are of a dull grayish-white, with a tinge of brownish yellow, in strong contrast with the color of the back and sides. The feet, with the fingers, are of a mixed brown and gray, except on the inner edge, where they are colored like the belly. The tail is like the back, except on the under surface, where it is of a sharply-defined whitish, like the belly.

Measurements of No. 629.	Inches.	Lines.	Measurements of No. 629.	Inches.	Lines.
Head to occiput	0	11	Longest toe from base	0	3
Head to root of tail	2	2	Skull, length	0	10
Tail to end of bone	2	10	Skull, width	0	$4\frac{9}{32}$
Tail to end of hairs ¹	3	0	Length of palate	0	$4\frac{2}{32}$
Fore foot from wrist	0	$4\frac{1}{2}$	Width of upper jaw	0	$2\frac{5}{32}$
Hind foot from heel	0	$9\frac{1}{2}$			

Skull. The skull of this species is remarkably slender and attenuated anteriorly; the greatest width of the upper jaw being but half that of the cranium. The dental formula is—

Anterior incisors, $\frac{2}{2}$; premolars, $\frac{5-5}{2-2}$; molars, $\frac{4-4}{3-3} = 32$.

The upper anterior incisor is long and curved, with a distinct hooked tubercle near its base on the inferior edge; this is a miniature of the larger hook at the end of the tooth. The two succeeding teeth are of equal size, and considerably larger than the basal tubercle just mentioned, which indeed is about as large as the fourth of the lateral teeth; the third tooth is less than the fourth, itself less than the first two; the fifth, as usual, is very small, and wedged in between the fourth and the first molar. The lateral anterior teeth all overlap each other in an imbricated manner. The lower anterior incisor has two tubercles in its middle region, just anterior to the next succeeding tooth, and a faint rounded notch midway between the most anterior tubercle and the tip. All the teeth have the points of a dark chestnut, occupying less than half of the anterior incisors.

This species, in some respects, comes very near the *Sorex fimbripes* of Bachman, but may be at once distinguished by the much longer tail, which is nearly one-half longer than the body, instead of being decidedly shorter. In *S. fimbripes* the body is $1\frac{1}{8}$ inches, the tail $1\frac{3}{4}$. The dental formula is probably the same, as the sixth "lateral incisor" of Bachman was probably the basal fang of the large anterior incisor. The hind feet are also much longer ($9\frac{1}{2}$ lines instead of 6). The coloration appears quite similar in the two species, and both probably belong to the same genus. The geographical distribution of the species is very different—one occurring in Washington Territory, the other in Pennsylvania.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
629	1,780	Fort Vancouver, W. T.	Dr. J. G. Cooper	Skin from alcohol.

¹ Fur between two and three lines long. The first four measurements taken before skinning.

SOREX, Linn.

Ears large, valvular, concha directed backwards, partly furred on both surfaces; tail about as long as the body, (exclusive of the head,) or longer, its hairs of equal length, except at the tip; feet moderate, not fringed; skull slender anteriorly and elongated; upper anterior incisor with a second basal hook, and a small angular process on the inner side, near the point; two anterior lateral teeth somewhat larger than the next.

The genus *Sorex* is common to both the old world and the new, and embraces a large proportion of the known species. The former have all five premolars, as in most of the American, and belong to the subgenus *Corsira* of Gray. I see no reason, however, for using either this name or *Amphisorex* of Duvernoy, in preference to *Sorex*, as the genus was established by Linnaeus in 1754, upon the species *S. vulgaris*, belonging strictly to the present group,¹ and very similar in dentition to *Sorex forsteri*.

The genus is divisible into two sections, one with 32 teeth, the other with 30; this difference accompanied by others hereafter to be mentioned. Most of the species belong to the group with 32 teeth. For the subdivisions of these sections see the list of species at the end of the article on the Sub-family *Soricinae*, page 10.

To the first group of the table, or those in which the third premolar is smaller than the fourth, belong all the species west of the Rocky mountains. The second group, with the gradation gradual, and the teeth imbricated, includes also the European members of the genus. This and the third division belong to the eastern and central portions of the continent. The species with 30 teeth have not been found south of the parallel of northern Ohio.

SECTION A, WITH FIVE UPPER PREMOLARS, TEETH 32.

Ears distinct, though not projecting visibly beyond the hair, furred on both sides; snout attenuated; tail as long as the body, (exclusive of the head,) or longer, light colored beneath; dental formula $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$; anterior upper incisor with a well developed basal hooked process and an internal lobe, usually in contact with its opposite; fifth lateral tooth very small; lower anterior incisor not extending backwards to the first molar, cutting edge with two or three lobed dentations; the first lateral tooth and half the second inserted above the base of the anterior incisor; teeth white, light chesnut only on the points; skull slender; feet moderate, not fringed; colors generally lighter beneath; no colored points on the inside of the lateral upper teeth at the base; lower angular process of lower jaw long and slender.

1. *Third upper premolar smaller than the fourth.*

SOREX TROWBRIDGII, Baird.

SP. CH.—Ears very large, not exceeding the long fur; fur full, longest hairs measuring over three lines; fore feet broad, contained $1\frac{1}{2}$ times in the hinder, which are barely a little more than two-thirds the length of the skull; tail as long as the body and half of the head; third lateral incisor smaller than the fourth; anterior upper incisor with a moderate internal lobe.

Color above, sooty brown or black, slightly variegated with hoary; beneath, a little paler, and very slightly different from the back; head and body, $2\frac{1}{2}$ inches; tail, 2; hind feet, over five-tenths of an inch.

Body slender, elongated; snout rather broad, depressed, and pointed; whiskers numerous, moderately long, and light colored; ears unusually large, although not longer than the fur on

¹ See Nathusius in Wiegmann's Archiv, 1838, 45.

the nape, covered thinly with hairs on both surfaces, the region about the meatus, however, being bare; the supplementary lobe of the ear with long hairs springing from the extreme edge; fur on the body very full and soft, measuring three lines on the back.

The fore feet are large in proportion, and quite broad, contained about one and two-third times in the hinder ones; the palms as broad or broader than the soles, being naked and without fringes; the tail is as long as the body, (exclusive of the head,) and is covered with short, stiff, appressed hairs, which are of equal size everywhere, and furnish but a very stunted pencil at the end.

The prevailing color of the upper parts and sides is a dark sooty brown or black, with a hoary intermixture, the hairs being very dark lead color to near the tip, then light grayish and tipped with sooty brown; the under parts are not conspicuously different from the upper, being of a dark, smoky ash, or plumbeous; the tail is colored like the back, except on the under surface, which is of a decided and well defined whitish; the feet are pale brownish.

The skull is slender, and much attenuated; the teeth $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$; the upper anterior incisor with a spur or hook at the base, intermediate in size between the 3d and 4th lateral teeth; the lower anterior incisor has two tubercles or swellings in the cutting edge near the base, the posterior nearly obsolete, with a notch in front of the anterior one; the first two lateral upper teeth are of equal size, much larger than the third, and twice the size of the fourth; the fifth is very small.

Measurements.

	813. (Dried skin.)	867.
	Inches.	Inches.
Length to root of tail.....	2.5	2.2½
Tail to tip of hairs.....	2.1	2.0
Tail to tip of bone.....	2.0½	1.11½
Fore feet from wrist.....	0.3½	9.3½
Hind feet from sole.....	0.6	0.6¼
Longest toe.....	0.2½	-----
Breadth of palm.....	0.1½	-----
Length of skull.....	0.8½	-----
Length of palate.....	0.3⅞	-----
Width of upper jaw.....	0.2⅞	-----

This species approaches nearest to the *Sorex palustris* of Richardson; but, judging from the description, differs in the following points: there are five lateral incisors, instead of four; the tail is longer, and the size every way less. (Body 2½, not 3½, inches.) There would seem to be more difference in the color of the two surfaces, under and upper, in *S. palustris*, than in the present species. The geographical distribution is also different, the *S. palustris* coming from the Hudson's Bay region, the present one from Oregon, on the Pacific coast.

From *S. forsteri*, Rich., it differs in the considerably longer tail, the disproportion of the third lateral upper tooth, and the darker under parts.

From *Sorex richardsonii* of Bachman, it is distinguished by the longer tail and by the nearly uniform tint of the two surfaces.

From *S. parvus* of Richardson, (not Say,) by much the same characteristics.

Since preparing the preceding description, a third and fourth specimens in alcohol have been received from Fort Steilacoom, agreeing very well with the above, except that the under parts are a little lighter, with a faint rusty tinge. The line of demarcation is, however, not distinct, the hoary sooty brown of the back passing insensibly into the belly. The ear is large, about as long as the fur; it is clothed with long hairs on its margin, otherwise nearly naked. The tail is cylindrical, the annuli quite conspicuous.

Measurements. (Specimens in alcohol.)

	1676.	2046.
Head	0.85	0.83
Head and body	2.40	2.32
Tail, (vertebræ)	2.00	1.63
Tail, (hairs)	2.15	1.65
Hand	0.30	0.25
Foot	0.55	0.57
Ear	0.30	-----

List of Specimens.

Catalogue Number.	Corresponding No. of skull.	Sex & Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by
967	-----	-----	Astoria, Oregon	June 10, 1855	Lt. W. P. Trowbridge, U.S.A.	Skin	Jas. Wayne.
813	3088	♂	do	-----	do	do	do
1676	-----	-----	Ft. Steilacoom, W.T.	1856.	Dr. George Suckley, U.S.A.	In alcohol.	Dr. Suckley.
2046	-----	-----	do	do	do	do	do

SOREX VAGRANS, Cooper, Mss.

SP. CH.—Ears moderately large, though little more than half as long as the adjacent fur. Fur rather full and long; hairs on the back measuring two lines and a half. Feet rather small; anterior contained rather more than one and a half times in the posterior, which are a little over two-thirds the length of skull. Tail longer than the body, about five-sixths as long as head and body, scantily haired at tip. Third lateral tooth above, smaller than fourth. Anterior upper incisor, with a rounded internal lobe, in broad contact with its fellow.

Color above, olive brown, varied with hoary; beneath, dusky yellowish white. Sides a little paler than the back. Head and body, 2 inches. Tail, 1 $\frac{3}{4}$. Hind foot about 0.47 of an inch.

Description from Nos. 630, 1675.—Body rather stout and full. Fur long, measuring three lines on the back. The ears are large and the aperture wide, the concha is not, however, as long as the fur, and is usually concealed in the hair. The internal surface is well covered with fur along the upper margin, as well as on the edges of the supplementary lobes.

The feet are rather small, the palm as broad as the soles, both naked, with a slight ciliation on the latter. The tail is about five-sixths as long as the head and body, slender, depressed,

and scantily clothed with short stiff depressed hairs, which constitute a very small pencil at the end. The fur is very long and full, measuring three lines on the back.

The upper parts are of a rather dark olive brown, with a hoary tinge, caused by penultimate bars of grayish on the hairs. The sides are paler, with a tinge of chestnut; the under parts are of a yellow brownish white. The feet and under surface of the tail are white, with a dusky yellowish tinge.

The skull is moderately slender anteriorly. The dentition is $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$. The upper anterior incisor has a second hook at the base, decidedly smaller, however, than the one in front of it forming the tip of the tooth and about equal to the third lateral tooth. The first two lateral teeth are of equal size, and decidedly larger than the fourth, which, however, is larger than the third. The teeth are all chestnut colored at the tips.

Measurements of 630 (first four taken before skinning).

	Inches.	Lines.
Nose to occiput.....		
Nose to root of tail.....	2	
Tail to end of vertebrae.....	1	
Tail to end of hairs.....	1	8½
Hand from wrist.....		3½
Foot from heel.....		5½
Skull, length.....		8
Skull, width.....		3½
Length of palate.....		3½
Width of upper jaw.....		2½

Several specimens in alcohol agree essentially with the preceding description taken from a dried skin. In one or two the color of the back is a brighter chestnut than as described. There is considerable difference in the thickness of the tails at the base, and the swelling of the head; these, however, are probably sexual characters, as they are most marked in the males. In most specimens, the terminal pencil of hairs of the tail is worn off to a stump, or else wanting, leaving the tip of the tail naked. In 1259 this pencil is, however, visible.

Measurements from alcoholic specimens.

	1675.	1261.	1259.
Length of head.....	0.87	0.86	0.87
Head and body.....	2.21	2.55	2.26
Tail to end of vertebrae.....	1.67	1.15+	1.75
Tail to end of hairs.....	1.67	1.15+	1.85
Fore foot.....	0.29	0.28	0.28
Hind foot.....	0.50	0.49	0.49
Ear.....	0.25	0.26	0.25

There are three specimens of this species from Petaluma, California, in the collection of Mr. Samuels, which bear evident marks of immaturity, although they have nearly attained to their full size. The teeth were all covered by a membrane, which, however, on being taken off, exhibited the dentition complete in every particular, (32 teeth,) and all more or less dark colored at the tip. As illustrating more fully the characters of the species from better preserved specimens than those above described, I shall proceed to give a detailed description.

The form of these specimens is more mouse-like than usual, owing to the large feet and tail, the rather short head and the full body. The naked muffle is unusually broad, and slightly divided medially by a furrow. The muzzle is broader than usual, depressed; the eye rather large, distinctly visible, and nearer the muzzle than the ear. The ear is concealed by the fur, and is much shorter than usual; the antitragus large, valvular, and with the valvular helix naked, except on the edges; the concha is covered with hair on the margins and posteriorly.

The tail (vertebræ) is about as long as the body, exclusive of the head; it is thick, cylindrical, but little narrower at the base, and densely covered with hairs, so as nearly to conceal the annuli; it is terminated by a scant pencil.

The fur is short, but soft and full; it measures about 0.18 of an inch on the back.

The feet are unusually large and broad for the species of this section, more so, in fact, than in full grown specimens. The two pairs are of about equal width; well covered above by long silky bristles, which form a distinct fringe on the outer edge of the palms. The soles are tubercular and naked, though the hinder part of the heel is covered with short hairs, except along a narrow line. There are, as usual, six larger tubercles among the smaller ones.

The color above is a light clove brown, with a very slight tinge of chestnut or cinnamon.

The hairs are very lustrous, and there is an intermixture of hoary, caused probably by stronger reflections in particular hairs. The under parts are grayish, lighter than above, the gradation rather insensible. The tail is dusky at the tip, and rather lighter below; the feet also are rather pale, especially on their inner portions.

The skull is large and broad, with less attenuation than usual. The dentition embraces 32 teeth. The anterior upper incisor is much curved, with a basal hook, which is narrow and acute, nearly as long but narrower than the first and second premolars. The third premolar is only about half the size of the fourth, which is a little less than the first two. The fifth is, as usual, diminutive, but distinctly visible in the diastema between the molars and premolars. The lower anterior incisor is rather deep, and with three prominent lobes on the cutting edge. The first premolar is large, the second twice the size, with two distinct cusps.

Measurements.

Current Number.	Locality.	From tip of nose to—				Tail to end of—		Length of—		Width of palm.	Skull.		Width of jaw.	Width of palate.	Nature of specimen.
		Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.		Length.	Width.			
1681	Petaluma, Cal.	.....	.....	0.85	1.96	1.42	1.55	0.27	0.47	0.13	0.70	0.32	0.17	0.27	In alcohol.
1682	do.....	0.30	0.54	0.81	1.95	1.22	1.35	0.27	0.47	0.13	.....	.....	.....	.....	.....do.....
1683	do.	0.30	0.54	0.81	1.95	1.46	1.60	0.27	0.47	0.13	.....	.....	.....	.....	.....do.....

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained. "	Nature of specimen.	Collected by
630	1781	♂	Shoalwater Bay, W. T.	-----	Dr. J. G. Cooper. -----	Skin fr. alc.	-----
1675	-----	♂	-----do-----	-----	-----do-----	-----do-----	-----
1261	-----	♀	Cape Flattery, W. T.	Sept. 1855	Lt. W. P. Trowbridge, U. S. A.	In alcohol.	-----
1259	-----	-----	Cascade Range, O. T.	-----do-----	Lt. Williamson, U. S. A.	-----do-----	Dr. J. S. Newberry.
1681	-----	-----	Petaluma, Cal.	1856.	E. Samuels.	-----do-----	-----
1682	-----	-----	-----do-----	-----do-----	-----do-----	-----do-----	-----
1683	-----	-----	-----do-----	-----do-----	-----do-----	-----do-----	-----

SOREX SUCKLEYI, Baird.

SP. CH.—Ears quite large; about as long as the adjacent fur. Longest hairs measure barely two lines. Feet rather small; the anterior contained nearly twice in the posterior, which barely exceed two thirds of the skull. Tail considerably longer than the body without the head; well coated with hair; caudal vertebrae, 16. Third lateral tooth above smaller than the fourth. Width of skull rather more than half its length; palate, three-eighths this length.

Color above, light chestnut brown; beneath, grayish white. Length, $2\frac{1}{4}$ inches. Tail, $1\frac{1}{2}$? Hind foot, 0.46 of an inch.

(Nos. 362, 1677.) This species has very close relationships to *S. cooperi* and *platyrhinus*, its distinctive characters being only evident after careful comparison of teeth and skull, as well as of external characters. The snout is much elongated in the prepared specimen, though probably less so really than in *S. platyrhinus*, judging from the skull. The ears are conspicuous, though not quite as long as the fur; they are well coated with fur on the sides and edges, except around and in front of the meatus. The feet are rather small; the anterior contained nearly twice in the posterior. The palms and soles are naked, the latter with overhanging hairs. The claws of the first and fifth toes reach to the penultimate articulations of the adjacent second and fourth. The tail is longer than the body, exclusive of the head. The fur is soft, and on the back about two lines in length or less.

The upper parts and sides are of a rather light chestnut brown, with a slightly hoary appearance, caused by this color being still lighter penultimate to the tip of the hairs. The under parts of the body and tail, with the feet, are of a brownish white or gray.

The skull is short and thick for the species of this group, considerably exceeding, in this respect, the *S. platyrhinus*. The breadth is more than half the length, instead of being less. The dental formula is $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$. The third upper lateral tooth is decidedly less than the fourth, as in all the western shrews that I have examined.

Measurements. (Mounted specimen.)

	Inches.	Lines.
Snout to root of tail.....	2	2
Tail to end of vertebræ.....	1	2½
Tail to end of hairs.....	1	4½
The tail vertebræ removed from the skin, however, measure..	1	6½
Hand.....		3
Foot.....		5½
Length of skull.....		8
Width of skull.....		4 +
Length of palate.....		3
Width of jaw.....		2

Specimens in alcohol.

	1677.	1264 ?
Head.....	0.80	
Head and body.....	1.90	2.00 ?
Tail, (vertebræ).....	1.70	1.40
Tail, (hairs).....	1.80	1.50
Fore foot.....	0.25	0.35
Hind foot.....	0.46	0.46
Ear.....	0.26	

As already remarked, this species is externally very similar to the *S. cooperi*, and the imperfection of the specimen renders it still more difficult to distinguish. The shape of the skull and teeth will, however, furnish ready grounds for separating the two—better, indeed, than in many cases where the differences of external form are more striking. The size appears somewhat larger, and the tail shorter, though this may be owing to imperfect stuffing. The feet are rather smaller, and the three central toes not so much elongated; consequently the first and fifth claws extend further along the adjacent toes, reaching the penultimate articulation, instead of falling short of it. The soles are apparently without the two large tubercles on each edge, and are more covered by hair. The color is much the same, although there is a slightly hoary appearance in the present species not found in the other. The ears appear much the same. As stated, however, in this species, the skull is very decidedly fuller in the region of the cranium, as well as higher and broader anteriorly, less attenuated every way; the longitudinal axis of the skull and of the palate both shorter, and the palate wider. The third lateral upper tooth is smaller than the fourth, instead of being equal to it, and the fourth tooth is larger than in its analogues in the other species.

The characters of this species are perhaps more like those of *S. personatus*; the size is, how-

ever, much greater, its feet shorter, and its teeth different, although the shape of the skull appears somewhat similar.

From *S. vagrans* it differs in its chestnut brown color above, instead of olive brown, and the less pure light color of the belly. Its fur is much shorter, the feet smaller, the skull is broader, the ears considerably smaller.

Several specimens of what I refer to this species, collected in more southern localities, differ a little in color. They are considerably darker, more of a clove brown, with no chestnut tinge, and there is a considerable admixture of hoary, caused by the fact that the extreme tips of the hairs are darker than the penultimate portion.

Measurements.

Current number.	Locality.	Nose to—		Tail to end of—		Length of—		Ear.	Nature of specimen.
		Occip.	Tail.	Verteb.	Hairs.	Fore foot.	Hind foot.		
1678	Petaluma, California....	0.80	2.00	1.40	1.40	0.26	0.45	0.26	Alcohol.
1679	-----do-----	0.80	2.00	1.32	1.32	0.26	0.45	0.26	-----do-----
1680	-----do-----	0.81	1.75	1.30	1.49	0.25	0.45	0.21	-----do-----
2085	Monterey-----	0.82	2.05	1.19	1.25	0.25	0.45	-----	-----do-----

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Collected by
362	1276	Steilacoom, W. T.-----	-----	Dr. George Suckley.	24	Mounted..	-----
1677	-----	-----do-----	-----	-----do-----	-----	In alcohol	-----
1264	-----	Upper DesChutes river, O.T.	Sept. 1855	Lt. R.S. Williamson.	-----	-----do-----	Dr. J.S. Newberry
1678	-----	Petaluma, California....	1856.	E. Samuels.	-----	-----do-----	-----
1679	-----	-----do-----	-----do-----	-----do-----	-----	-----do-----	-----
1680	-----	-----do-----	-----do-----	-----do-----	-----	-----do-----	-----
? 2085	-----	Monterey, California....	-----do-----	A. S. Taylor.	-----	-----do-----	-----

2. Third upper premolar larger than the fourth.

SOREX PACHYURUS, Baird. N. S.

SP. CU.—Ears moderate, though distinct; not half so long as the adjacent hairs. Fur very full, the longest hairs measuring over five lines. Feet and hands very stout and broad; the latter contained about one and a half times in the former, which are about two-thirds the length of the skull. Tail very thick throughout its whole length, with a decided pencil at the tip; about seven-ninths the length of head and body; longer than the body alone. Third lateral tooth above larger than the fourth. No internal lobe to the anterior upper incisors, but these are somewhat widened and in contact near the rounded point. Premolars not imbricated.

Color above, light olive brown, becoming much darker on the rump; beneath, ashy white, with a tinge of brownish; sides of a tint of brown paler than that on top of the head. Head and body, $2\frac{1}{4}$ inches. Tail to end of hairs, $1\frac{1}{4}$.

The body of this species appears unusually stout and full, owing to the length of the fur, which exceeds that of any American species with which I am acquainted, measuring on the back, 5 lines. Its large feet and claws, and very thick tail, are also highly characteristic.

The ears are of moderate size, the concha short, scarcely more than a line high, not coming far round the meatus, and much shorter than the fur. It is scantily coated with hair on the margin of the internal face, and with longer ones on the edges of the supplementary lobes.

The feet are unusually large and broad; the palms as broad, or a little broader than the soles; both are naked, and on the edges of the latter there is a slight indication of ciliation. The fore feet are larger in proportion than the hinder, being contained but one and a half times in them. The claws, too, are larger than usual, and about as long on the fore as on the hind feet.

The tail appears very thick, as much so as that of *Mus musculus*. It is about seven-ninths as long as the head and body, (measured to the tip of the hairs,) and is well coated with long, stiff, bristly, appressed hairs, which conceal the annuli, and terminate in a decided pencil at the end.

The upper parts are of a smoky olive brown anteriorly, becoming considerably darker towards the tail. The sides are of a lighter tint of the same brown as that on the top of the head, with a slight tinge of chestnut. The under parts are of a dull reddish brownish white. The color of the sides is in a broad stripe, quite clearly defined against that of the back and belly. The tail is like the back, and tipped with dusky; its under surface and the feet pale brownish, or brownish white. Claws bright yellow.

The skull is slender anteriorly, though the muzzle is stouter than in *S. navigator*. The dental formula is $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$. The anterior upper incisor is bidentate, the posterior lobe or hook nearly as large as the anterior, and coming down nearly to the line with it and the next teeth; it is about the size of the third lateral tooth. The five lateral teeth overlap each other, and diminish gradually and regularly from the first to the fifth, which is rather larger than usual, and visible from the side. There are three very decided lobed serrations on the lower anterior incisor. All the teeth are chestnut at the tips.

Measurements.

	626.	1674.
	Inches.	Inches.
Nose to occiput.....	1.00	0.97
Nose to root of tail.....	2.25	2.40
Tail from root to end of vertebræ.....	1.58	1.54
Tail from root to end of hairs.....	1.75	1.65
Fore feet from wrist.....	0.33	0.33
Fore feet, width.....	0.12 $\frac{1}{2}$	-----
Hind feet from heel.....	0.50	0.55
Skull, length.....	0.79	-----
Skull, width.....	0.38	-----
Length of palate.....	0.32	-----
Width of upper jaw.....	0.18	-----

The first four measurements of No. 626, and all of 1674, were taken from the specimen before skinning.

I refer, with some hesitation, to this species, a specimen from Fort Ripley. The tail is mutilated, and its otherwise indifferent state of preservation increases the uncertainty. It has, moreover, a stronger tinge of rufous beneath.

This species is readily distinguished from its congeners; as, from *S. forsteri*, by its full fur, thick and hairy tail, large feet, &c.; from *S. richardsonii*, by having unusually large and stout feet; a longer tail, different color, smaller size, &c.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	Whence obtained.	Nature of specimen.
626	1777	-----	Pembina, Minnesota	Charles Cavileer.....	Skin from alcohol.
1674	-----	-----	do.....	do.....	In alcohol.
638	1789	♂	Fort Ripley, Minnesota.....	Dr. J. F. Head, U. S. A.....	Skin from alcohol.

SOREX FORSTERI, Rich.

Sorex forsteri, RICH. Zool. Jour. III Jan.-Apr. 1828, 516.—IB. F. B. A. I. 1829, 6

BACHMAN, J. A. N. S. Phila. VII, 1837 386; pl. xxiv, f. 6.

DEKAY, N. Y. Zool. I, 1842, 20; pl. xxi, f. 3.

AUD. & BACH. N. Am. Quod. III, 1854, 310. (Copied from Bachman)

Corsira forsteri, GRAY, PR. Zool. Soc. Lond. V, 1837, 124.

SP. C4.—Ears rather small, about half as large as in *S. townsendii*; as long as the adjacent fur, longest hairs measuring about 0.25 of an inch. Feet rather small; the anterior contained about one and two-third times in the hinder. Tail shorter than the body, about two-thirds as long as head and body together; nearly naked towards the tip. Premolars tiled; third tooth above larger than the fourth. Anterior upper incisor, with small sharp internal subterminal lobe; the opposite in contact.

Color above, smoky brown or plumbeous gray, slightly hoary; beneath, pale grayish ash, decidedly lighter than the back. Head and body, 2½ inches; tail, 1½ inches. Hind foot, 0.5 of an inch.

The snout is rather slender, much pointed, with a naked and bilobed muzzle. The ears are moderately large and readily distinguishable in the fur, although not projecting beyond it, in fact barely equalling this in length. They are suborbicular; their edges entire, (not split,) inflexed below; sparsely coated with furry hairs on both surfaces, densest near the margin. The fifth claw in the hind foot scarcely reaches the base of the fourth, and the first claw falls short of the base of the fifth. The sole appears entirely naked from the heel. The fore feet are about two-thirds of the length of the hinder. There is little or no tendency to a fringe to the feet or their digits; their upper surfaces are well covered with short hairs. The tail is nearly two-thirds the length of the head and body; it is cylindrical, flattened at tip, (in dried specimens,) and encircled by numerous narrow annuli. The hairs in the tail are, for the most part, very short, scarcely extending more than the width of a single annulus, against which they are closely pressed. The extreme tip of the tail, where flattened, is, however, entirely naked, and has somewhat the appearance of possessing tactile sensibility. There is a narrow linear space

in the side of the body, covered with hairs much shorter than elsewhere, indicating the position of the musk gland.

The upper parts, generally, are of a bluish hoary, with a slight tinge of brown; beneath, the tint is brownish gray, considerably paler than the back. The feet and lower surface of the tail are brownish white; the upper surface of the latter like the back; its extreme tip quite dusky. The fur, when examined closely, is seen to be of a clear plumbeous, tipped with the colors mentioned; but between their base and tips are three very narrow, nearly obsolete, rings of lighter, readily visible, where a portion has been lost. The teeth are white, with the extreme tips only light chestnut, differing greatly in this respect from the conspicuous coloration of *S. talpoides*.

Dimensions of 622. (Specimen in alcohol.)

	Inches.	Lines.
Nose to occiput		10
Nose to ear		8
Nose to root of tail	2	9
Tail from root to end of vertebræ	1	8
Tail from root to end of hairs	1	8
Ears, height posteriorly		2½
Arm, fore foot to end of claws		3½
Arm, longest claw		0¾
Leg, hind foot from heel to end of claws		6
Leg, longest claw		0¾

The skull is too much broken to exhibit properly its shape. The dentition is as follows: $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$. The hook at the base of the anterior upper incisor is about as large as the third lateral tooth; these lateral teeth diminish regularly and very gradually from the first to the fourth, or even the fifth, and are all much imbricated. The fifth is smallest, though larger than in some species. The lower anterior incisor has two lobes or obtuse serrations.

This species resembles somewhat No. 813 (*Sorex trowbridgii*) from Astoria; it differs, however, in a much smaller ear, smaller hands and feet, shorter tail, lighter color, &c. The skull is considerably broader in the muzzle. The anterior upper incisors are larger and more curved; the lateral teeth diminish gradually from the first to the fifth, instead of having the third abruptly smaller than the second and considerably less than the fourth. The serrated lobes of the lower anterior incisor are larger.

The present species agrees very well with the description of the *Sorex forsteri*, as given by Dr. Bachman, from New York, although not very well with the species of Richardson. Still the differences are not very tangible, and the name may properly be retained, for the present at least. It is uncertain whether Richardson's specimen came from the Hudson's Bay region, or from the Columbia—probably, however, from the former; in which case, there is the more likelihood of its occurring in New York.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
622	1773	Carlisle, Pennsylvania.....	S. F. Baird	Skin from alcohol

SOREX RICHARDSONII.

Sorex richardsonii, BACHMAN, Jour. A. N. Sc. Ph. VII, 1837, 383; pl. xxiv, f. 5.

AUD. & BACH., N. A. Quod, III, 1854, 334, (from Bachman.)

WAGNER, Suppl. Schreb. V, 1855, 546.

? *Sorex parvus*, RICHARDSON, F. B. A. I 1829, 8.

SP. CH.—Ears rather small, distinctly visible in the scanty fur. Longest hairs measuring about 0.15 of an inch. Tail shorter than the body; scant haired. Color above, rusty iron gray; insensibly paler beneath. Feet and under side of tail brownish white. Length, $2\frac{3}{4}$ inches. Tail, less than $1\frac{1}{2}$. Hind foot, 0.5 of an inch.

A single skin of what I believe to correspond to the *Sorex richardsonii* of Bachman, has a considerable resemblance to *S. forsteri*, as described above, but is larger, and the tail shorter in proportion. Like it the ears are small for this group, less than in the much smaller *S. cooperi*. The tail is shorter than the body, exclusive of the head; but scantily provided with hair. The hairs of the back are very short, only about 0.15 of an inch. There is a distinct gland on the side, about one-third of an inch long, and one-twentieth wide, covered with short close silky hairs, indicating the position of the musk gland. The dentition appears similar to that of *S. forsteri*. The color above is a rusty iron gray, the under parts a little lighter. Feet, and under surface of tail, light brownish yellow.

I regret that the condition of the specimen does not admit of a more accurate description, nor do I feel at all confident that it is really distinct from *S. forsteri*. Of its representing the *S. richardsonii* of Bachman, I have little doubt, from the description and locality.

Measurements.

	Inches.
From nose to root of tail, (overstuffed).....	2. 90
Tail to end of vertebrae.....	1. 38
Tail to end of hairs.....	1. 44
Fore foot.....	0. 35
Hind foot.....	0. 50

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
830	Racine, Wisconsin.....	Dr. P. R. Hoy	Skin.

SOREX PLATYRHINUS.

Otisor ex platyrhinus, DEKAY, N. Y. Zool. I, 1842, 22; pl. v, f. 1.

Sorex platyrhynchus, LINSLEY, Sill. Am. J. Sc. XLIII, 1842, 346.

Sorex platyrhinus, WAGNER, Suppl. Schreb. V, 1855, 547.

Sorex forsteri, GAPPER, Zool. Jour. V, 1830, 201; pl. vii.

THOMPSON, Nat. Hist. Vermont, 1842, 26.

SP. CH.—Ears large and conspicuous. Tail scarcely longer than the body, and only scantily provided with hair. Upper premolars imbricated anteriorly; and decreasing gradually in size. Color above, chestnut or dark brown; beneath, pale cinerous. Length, over two inches. Tail scarcely exceeding $1\frac{1}{2}$ inch.

(No. 1694.)—This very diminutive and slender shrew has an exceedingly attenuated and elongated muzzle, which, however, is depressed towards the naked and bilobed tip. Viewed from above, there is a slight contraction in the outline of the head, a little anterior to the eye, beyond which it swells out again, before tapering to the end. The width of the head is about half its length, or a little less. The end of the lower incisor falls about midway between the tip of the nose and the eye, which is quite large for a shrew, and distinctly visible without a glass. It is situated about halfway between the tip of the nose, and the anterior base of the external ear.

The whiskers are numerous and thickly set; they are black, and the longest reach back nearly to the occiput.

The ears are very large, (for American shrews,) and generally distinctly visible, though scarcely projecting beyond the fur. The internal ear is widely open, and the concha is directed backwards, as in the genus *Mus*. The antitragus is very large and semi-circular, and fits closely, like a valve, over the meatus, protecting it from the admission of water; when this is closed, however, the rest of the ear is distinctly visible. The concha is semi-circular in shape; its upper and lower roots about 0.21 of an inch apart, or the distance from incisors to tip of muzzle; the meatus occupies only the lower third of this distance, and the upper root of the concha does not extend beyond the posterior margin of the meatus. There is a vertical partition or flap of skin extending across the concavity of the ear corresponding to the helix, which, however, does not rise as high as the margin of the concha. The convexity and edge of the ear are rather thickly covered with hairs, as also the edges of the antitragus and internal flap; the remaining portions are naked. The greatest distance from the lower root of the concha to its most remote point is 0.29 of an inch, or about the distance from the root of the concha to the eye.

The feet are moderately large; the anterior about as broad as the posterior, and about 0.55 their length. The fore and hind claws are about equal. The under surfaces of the feet are naked, the hinder ones with small tessellated tubercular plates, and the larger tubercles opposite the middle of the metatarsus. Besides these, there are four other large tubercles at the bases of the first, second, and fifth toes, and between the bases of the third and fourth.

The hair on the back is about 0.20 of an inch long. The tail is long; without the hairs, it reaches to the meatus, or is about as long as the body; it is cylindrical, somewhat thickened towards the middle, closely annulated, and with hairs springing between the annuli, and extending over about three of the latter; it is terminated by a pencil of long hairs.

The upper parts are of a rather light chestnut brown, with a hoary aspect, owing to the tips being abruptly of this color, but a little lighter penultimately. The under surfaces are grayish

white, with a slight tinge of brown; the color well contrasted against the back. The feet and under surface of the tail are whitish; the upper surface of the tail like the back; the entire tip dusky. The teeth are light chestnut at the point.

The upper premolar teeth are imbricated anteriorly, and diminish from the first to the fourth with considerable regularity; the difference between the third and second being much less appreciable than in *S. cooperi*.

The weight of a specimen of this species, as given by Linsley, is 47 grains; that of number 1696, however, of the accompanying table, amounted only to 37 grains.

For the measurements of the skull of this species, see the table under the head of *S. cooperi*.

There are some slight variations from the above characteristics in different specimens. Thus, the tail is sometimes a little longer or shorter. The ear varies somewhat in size. Sometimes the chestnut of the back is of a browner or darker shade—a characteristic, probably, of the winter pelage. In immature specimens, the tail is almost naked, and the tips of the teeth with little or no color, even when of full size.

This species is perhaps more nearly related to *S. forsteri* than to *S. cooperi*, although resembling the latter most in color. In size it occupies an intermediate position, as also in the proportional length of the tail.

Its distribution I have not yet ascertained with precision, though it is known to range from eastern Massachusetts to Cleveland, Ohio, and as far north as Burlington, Vermont.

List of specimens and measurements.

Current number.	Locality.	Sex.	Nose to—		Tail to end of—		Length of—		Ear.	Nature of specimen.	From whom received.
			Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.			
1691	Hingham, Mass.		82	2.10	1.50	1.65	25	45	25	In alcohol.	Dr. T. M. Brewer.
1693	Middleboro, Mass.		85	2.15	1.46	1.65	25	47	25	do	J. W. P. Jenks.
	April & May.										
1694	do.		85	2.04	1.50	1.60	25	46	25	do	do
1695	do.		85	2.25	1.40	1.50	25	46	25	do	do
? 1696	October		81	2.00	1.62	1.85	25	46	25	do	do
1697	do.		80	2.10	1.46		25	46		do	do
1698	Spring		85	2.19	1.55	1.65	25	46	25	do	do
1699	do.	♂	85	2.18	1.46	1.55	25	46	25	do	do
1700	do.		85	2.00	1.60	1.60	25	46		do	do
1701	do.		90	2.10	1.45	1.55	25	45		do	do
? 1702	December		85	2.00	1.60	1.80	25	46		do	do
1703	do.		85	2.18	1.45	1.60	25	46		do	do
1704	do.		80?	2.15	1.50	1.62	25	46		do	do
1705	do.		80	1.90	1.49	1.55	25	45		do	do
1706	do.		85	2.10	1.50	1.62	24	45		do	do
954	Nov. 1, 1855.	♂								Dry skin.	do
1084	Dec. 12, 1855.	♂								do	do
955	Oct. 29, 1855.									do	do
1436	Mar. 28, 1856.		84	2.25	1.50	1.58		45		do	do
814	Cleveland, Ohio.									do	Dr. Kirtland.
855 1597	Burlington, Vt.									do	Prof. Thompson.

3. Third and fourth upper premolars nearly equal and rather smaller than the two anterior ones.

SOREX COOPERI.

Sorex cooperi, BACHMAN, J. A. N. Sc. Phil. VII, 1837, 388; pl. xxiv, fig. 7.

AUD. & BACH., N. A. Quad. III, 1854, 311, (from preceding.)

? *Amphisorex lesuerii*, DUVERNOY, Mag. de Zool. 1842, mam. 33, pl. 50.*Sorex lesueri*, WAGNER, Suppl. Schreb. V, 1855, 54, in dark pelage.

SP. CH.—Very slender and small. Ears rather large, nearly as long as the adjacent fur. Longest hairs on back about one and a half lines. Feet slender but moderately long; tubercles on sole large and distinct; fore feet contained nearly twice in the hinder, which are about $\frac{5}{8}$ ths the length of skull. Width of skull rather less than half its length; palate more than $\frac{3}{8}$ ths this length. Tail nearly as long as head and body, well pencilled at the tip. Third upper premolar tooth above equal to the fourth. Premolars not imbricated. Anterior upper incisor with an inner lobe in contact with its fellow.

Color above, light chestnut-brown; beneath, pale-brownish, or chestnut white. Length, mostly under two inches. Tail, $1\frac{1}{2}$. Hind foot, 0.46 of an inch.

Body small and slender; snout elongated, acute, well provided with bristles. Ears large, not projecting, however, beyond the fur; well coated with hair on both sides, except around the meatus. Feet moderate. Hands contained about one and two-third times in the feet, which have the three middle toes lengthened so that the first claw does not reach the penultimate articulation of the second toe; and the fifth claw just attains to the penultimate articulation of the fourth toe. The soles are very naked, and exhibit a large tubercle on the base of all the toes, and another on each side behind these; they are so arranged as to present two on each edge of the sole. The tail is moderately stout, cylindrical, somewhat enlarged in the middle, and well covered with long hairs lying flat, and forming a decided brush at the end; including hairs, it is about $1\frac{1}{2}$ the length of head and body. Fur on the back measuring nearly two lines.

The prevailing color above is a light chestnut brown; beneath, brownish white, or very light chestnut white, as are the under surface of the tail, and the feet.

The muzzle is elongated and very slender; the dental formula $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$. The anterior upper incisor has a well developed basal hook, larger than usual, and coming down to the line tangent to the larger hook and the lateral teeth; this basal or posterior hook, is as large as the first two lateral teeth, which are equal, and larger than the next two, which are also equal; the fifth is very diminutive. The lower anterior incisor has three lobed serrations. All the teeth are chestnut at the tips.

List of specimens and measurements.

No. of speci'n.	Locality.	Sex.	Head.	Head and body.	Tail to verteb.	Tail to end hairs.	Fore feet.	Hind feet.	Ear.	Nature of specimen.	From whom received.
? 1689	Labrador.....	-----	81	1.70	1.56	1.80	25	47	----	Alcohol ..	Dr. J. Wyman ..
1690	Waterville, N. Y.....	-----	79	1.85	1.55	1.70	25	45	25	..do.....	H. Davis.....
$\frac{6.34}{17.84}$	Adirondac Mts, N. Y. ♀	♀	83	2.00	1.67	1.83	21	42	----	Skin	R. Clarke
1687	Burlington, Vt.....	-----	80	2.05	1.47	1.55	23	50	24	Alcohol ..	Z. Thompson... ..
? 1692	Middleboro', Mass.....	-----	85	1.90	1.36	1.65	-----	45	----	..do.....	J. W. P. Jenks..
? 1707	-----do.....	-----	85	1.90	1.50	1.70	25	46	----	Alcohol ..	-----do.....
$\frac{6.36}{17.87}$	West Northfield, Ill.	-----	83	1.83	1.50	1.75	21	45	----	Skin	R. Kennicott ..
2047	-----do.....	-----	82	1.86	1.23	1.39	24	45	----	Alcohol ..	-----do.....
$\frac{6.34}{17.86}$	Racine, Wisc.....	♀	75	1.06	1.58	1.75	22	42	----	Skin	Dr. Hoy.....
$\frac{6.36}{17.86}$	Fort Ripley, Minn....	♀	83	1.92	1.50	1.75	22	42	----	..do.....	Dr. J. F. Head.
1935	Medicine Bow river, Nebraska.	-----	85	2.05	1.41	1.53	25	45	----	Alcohol ..	Lt. F. T. Bryan & W. S. Wood.

Dimensions of the skull.

	S. cooperi.				S. platyrhinus.	
	633	634	635	636	1694	1697
Skull, length	.70	-----	.67	-----	.65	.69
Skull, width	-----	-----	.33	-----	.32	.30
Length of palate	.28	-----	.27	-----	.26	.25
Width of upper jaw	.15	.15	.15	.15	.15	.15

This species is closely allied to the *S. personatus*, having the same general form and color. It is somewhat larger, however, and the tail longer in proportion, nearly equalling the head and body. In some respects it resembles *S. cooperi* of Bachman, as in the size, color, and length of tail. It differs from the description, however, in having very distinct and well-defined ears, and in having only three true molars below instead of four. This latter character, however, if actually existing in *S. cooperi*, is entirely unique among the shrews, the invariable formula being 2 anterior incisors, 2-2 lateral teeth, and 3-3 molars, making 12 teeth in the whole jaw. The external ear, too, may readily have shrunk in drying so as to be inconspicuous, and thus give rise to the impression of its absence. In some dried skins before me there is little indication of ears, while they are very distinct in well prepared specimens, and especially in those preserved in alcohol. The size of the hind feet and the longer tail show that it is not the same with the specimen from Fort Union, at the mouth of the Yellowstone, (*S. haydeni*).

The skin described by Dr. Bachman was obtained in the "Northwest Territory," either Wisconsin or Minnesota. From the list of localities it will be seen that several are recorded from these regions, all agreeing essentially with those from New York. Indeed, it is the only small long-tailed of the group, having 32 teeth, yet received from Wisconsin and Minnesota.

After some hesitation I have come to the conclusion that the *Sorex cooperi* is distinct from the species so abundant in Massachusetts, and described by Dekay as *Otisorex platyrhinus*. It is appreciably smaller, with an absolutely longer tail and muzzle, the former much more hairy, especially at the tip. The skull is longer and more slender; the upper premolars are not imbricated anteriorly, but are distinct, though in contact, the points directed downwards, and even a little backwards. The 3d and 4th premolars are nearly or quite equal, and less than the 1st and 2d, instead of lessening gradually.

As this species is very closely allied to two others of the same group, it may be as well to present here the principal characters of all, before proceeding to describe the remaining ones. For the type of *S. cooperi*, I have taken a specimen of the smaller variety, with the longer tail; the larger one is still more distinct.

S. cooperi.—Head very long, over 8-tenths of an inch; ears conspicuous, not concealed; head and body nearly two inches long; tail vertebrae generally over $1\frac{1}{2}$; tail slightly swollen towards the middle; hind foot 0.45 of an inch; teeth light chestnut.

Above, light chestnut brown, more fuscous in winter. Beneath, whitish.

S. haydeni.—Head moderately long, under 8-tenths of an inch; ears large, but concealed

in the dense fur; head and body about $1\frac{3}{4}$ inches long; tail vertebræ $1\frac{1}{4}$; tail considerably swollen towards the middle; hind foot 0.40 of an inch; teeth pitchy chestnut.

Above, grayish chestnut brown. Beneath, whitish.

S. personatus.—Size very small; ears large; head under 7-tenths of an inch; head and body under $1\frac{3}{4}$ inches; tail vertebræ little over 1 inch; hind feet less than 4-tenths of an inch.

SOREX HAYDENI, Baird.

SR. CR.—Head less than 8-tenths of an inch; acutely attenuated. Body about 1.75 hundredths of an inch; vertebræ of tail 1.25. Tail very thick and swollen; hind feet 4-tenths of an inch; teeth pitchy chestnut.

Color above, grayish chestnut brown; beneath, whitish; upper premolar not imbricated; 3d and 4th equal, and decidedly less than the two anterior.

This very diminutive shrew has the head slender and acutely elongated; the body very slender. The muzzle is naked and quite deeply divided. The eye is rather prominent, its centre nearer the anterior base of the concha than the muzzle, showing this to be less elongated than in some species of the group. The ear is rather large and open, the concha directed backwards; the antitragal and helicoid valves large; naked anteriorly; full-haired on the edges. In fact, the furring of the ear is so full as quite to conceal the concha, and to convey the impression of its absence. The tail is about as long as the body, (without head,) or a little longer. It is very thin at the base, about the diameter of the tibia; it, however, swells rapidly towards the middle, and then tapers gently to the tip. It is round and densely clothed with long hairs concealing the annuli, and ending in a pencil.

The feet are small, especially the hinder ones, which are only about 4-tenths of an inch long. These are naked below, except at the heel, where they are covered with hairs, except a narrow space along the median line, which is, however, concealed by the overhanging bristles. The rest of the sole is covered with small tubercles, with six larger ones interspersed. The first claw reaches beyond the junction of the second and third; the second, third, and fourth are nearly equal, but progressively longer. The tip of the fifth claw reaches nearly to the base of the fourth. The feet are rather broad, and covered with longish lustrous hairs.

The colors of the shrew are a rather light, but not bright-grayish, chestnut brown above; beneath, lighter yellowish white, with a tinge of brown. The tail is brown above, dusky at the tip and beneath, with the feet light gray. The tip of the teeth are pitchy chestnut.

The skull is slender, but rather short. The teeth are 32 in number. The premolars are conical, not overlapping; the points acute and directed downwards; the two anterior about equal to the basal hook of the anterior incisor; the third and fourth equal, but abruptly smaller. The last premolar is very small. There is a prominent lobe on the inner side of the anterior upper incisors, each in contact with its fellow.

The lower anterior incisor is rather deep, with prominent lobes on the edge, besides the tip. It extends posteriorly to below the middle of the second premolar; this is distinctly bicuspid, the anterior cusp the highest.

Measurements.

Current number.	Locality.	Head.	Head and body.	Tail without hair.	Tail with hair.	Hand.	Foot.	Ear.
1684	Fort Union.....	.75	1.75	1.17	1.45	.22	.40	.25
1685	do.....	.75	1.90	1.25	1.50	.25	.40	.25
2048	do.....	.75	1.80	1.30	1.45	.25	.42	.24

Length of palate in 3096, 0.25 inches.

This species bears a close resemblance to *S. cooperi*, with the same dental formula of 32 teeth, but is even smaller in every respect; one specimen (1685) weighs but 38½ grains. The muzzle is shorter, and does not project so far beyond the incisors. The tail is appreciably shorter, but, at the same time, a good deal thicker, and, like the feet, covered with larger and more lustrous hairs. The hind feet are considerably shorter and broader, the heel more hairy; the three intermediate digits shorter. The ears appear smaller.

The skull is shorter, and perhaps not quite so slender. The teeth are much more extensively and deeply colored, being pitchy chestnut instead of light chestnut. The two anterior upper premolars are larger; the difference in size between them and the next two much more strongly marked; the internal lobes of the shorter anterior incisors more prominent.

Diminutive as this species is, it is yet appreciably larger than the *Sorex personatus*, which it otherwise resembles. The hind feet are about the same length, but with the hands, much broader; the tail, also, is larger and thicker in every way.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	By whom collected.
1685	-----	♂	Fort Union, Nebraska	1855	Dr. F. V. Hayden.....	In alcohol.	-----
1684	3096	♂	do.....	1855	do.....	do.....	-----
2048	-----	♀	Fort Pierre, Nebraska.	1856	Lt. G. K. Warren, U.S.A.	do.....	Dr. F. V. Hayden.

SOREX PERSONATUS.

Sorex personatus, GEOFF. Mem. du Mus. XV, 1828, 122.—IB. Mag. de Zool. 1833; pl. xiv.

FISCHER, Syn. 1829, 255.

BACH. J. A. N. Sc. Ph. VII, 1837, 398, (from Geoff.)

AUD. & BACH. N. A. Quad. III, 1854, 314, (copied.)

WAGNER, Suppl. Schreb. V, 1855, 548.

Sorex longirostris, BACH. J. A. N. Sc. Ph. VII, 1837, 370; pl. xxiii, f. 2.

AUD. & BACH. N. A. Quad. III, 1853; pl. cl, f. 3. (Description nearly same as that of Bach.)

SP. CH.—Size very small. Ears large, as long as the adjacent fur. Hairs on the back short, but little over a line in length. Feet slender, but moderately long; tubercles of soles not distinct; fore feet contained nearly twice in the hinder ones. Tail but a little longer than the body, exclusive of head; about two-thirds as long as head and body, with a brush at tip. Third and fourth lateral upper teeth equal. Anterior upper incisors with an inner lobe. Upper premolars not imbricated.

Color above and on sides, light chestnut brown; beneath, dull white, with a tinge of chestnut. Length, 1¼ inches. Tail, 1½. Hind foot, 0.39 of an inch.

This is one of the smallest of the American shrews I have yet seen, and almost the least of all North American quadrupeds. The body is very slender; the snout much elongated; the ears large, though not exceeding the fur, and more than usually hairy towards the margin of the exterior surface. The feet are moderate, the anterior contained about one and two-third times in the posterior. The tail, measured to the tip, is two-thirds the length of head and body, or two-fifths of the total length from snout to tip of tail; it is well coated with long appressed hairs, which entirely conceal the vertebræ and form a decided pencil at the tip. The fur is quite short, measuring a little over one line.

The upper parts and sides are of a light chestnut brown, darkest towards the rump. Beneath, the color is a rusty white. The under surface of the tail and the feet are similar.

Teeth, $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3}$. The upper anterior incisor has a well-defined basal hook, not so large as that at the tip of the tooth, and about equal to the third lateral tooth. First two lateral teeth about equal, and considerably larger than the third and fourth, which are about equal; the fifth is smallest, as usual, but can be seen from outside. Lower incisor with three well defined serrations. Tip of all the teeth chestnut.

Measurements. (First four taken before skinning.)

	Inches.	Lines.
Nose to occiput.....		8
Nose to root of tail.....	1	9
Root of tail to end of vertebræ.....	1	1
Root of tail to end of hairs.....	1	2
Hand from wrist.....		2½
Foot from heel.....		4¾
Width of upper jaw.....		1½

This species is closely allied to *S. platyrhinus*, although it is smaller; the tail and hind feet shorter in proportion. (See this species for further distinctions.)

It is with much pleasure that I am enabled to identify the hitherto obscure *Sorex personatus* of Geoffroy. A comparison of the specimen before me not only with the description, but with the beautiful figure given in Guérin's *Magazin de Zoologie*, 1833, shows a much more than usual agreement between the two in color, shape, dimensions, &c. The original specimen was collected in some one of the Atlantic States by Milbert, probably somewhere in the south; the precise locality is not specified by Geoffroy.

In the absence of specimens from the southern States of this form of shrews, I cannot speak very confidently; but I have little doubt that *Sorex longirostris* of Dr. Bachman is a synonym of this species. The dimensions and other characteristics as given, agree perfectly, especially in the very small size, (1.88 inches,) rather short tail, (1 inch,) and very small hind feet, (only 0.38 of an inch.) It is true that Bachman calls *S. cooperi* the smallest species, but he at the same time gives to it the same length of body, a longer tail, (1.88 inches,) and longer hind feet, (0.44 inches.) The figure of *S. longirostris*, in the *Journal of the Philadelphia Academy*, is much longer than as described, (2.25 inches,) from which I infer that the article on the spe-

cies was written before the animal was skinned; that it was overstuffed in the preparation, and that in this state the figure was made, as well as the comparison with *S. cooperi*.

St. Hilaire speaks of the ears as small and concealed by the fur, and Bachman calls them large; but these terms are purely relative, and although the ears are really larger than usual in most American shrews, yet they are greatly surpassed by many European ones. The figure, in fact, exhibits the ears distinctly; as much so as is required when the fur is in its natural position and not pushed forward, as in Bachman's figure.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
637	1788	Washington, D. C.-----	Dr. C. Girard.-----	Skin from alcohol.

SECTION B, WITH FOUR UPPER PREMOLARS, TEETH 30.

Similar to section A in ears and tail; feet small and weak; dental formula, $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. No diastema between the lateral upper tooth and first molar; upper anterior incisor bidentate; lower anterior incisor extending back nearly to the posterior end of the second lateral tooth.

SOREX HOYI, Baird.

SP. CH.—Very small and slender. Ears prominent, but not quite as long as the adjacent ear, which measures scarcely one and a half lines. Feet very small; the posterior, five-eighths the length of the skull. Tail about as long as the body, exclusive of the head. Only four lateral upper teeth; all the teeth large and dark colored. Anterior upper incisor with very prominent serrated lobe on the inner face, in contact with its opposite.

Color above, olive chestnut brown, with a little hoariness; beneath, dull rusty white. Tail bicolor. Length, about $1\frac{1}{2}$ inch. Tail, $1\frac{1}{4}$.

Description of a specimen in alcohol, 1688.—In general form this shrew is very slender; the snout attenuated, but rather broad above. The muffle is rather broad, naked, and bilobed; it projects far beyond the lower lip. The eye is small, but distinctly visible, about midway between the occiput and the muzzle; considerably nearer the anterior base of the external ear than to the tip of the nose. The ear is large; the antitragus and helix valvular, and margined with hairs; the concha rather short, hairy on the margin and edge, and directed backwards. The tail is as long as the body, exclusive of the head; it is rather thick, slightly contracted at the base, tapering gently from the middle to a rather blunt tip, and with very few and short hairs; in fact, the terminal portion is quite naked.

The feet are very small, the hinder ones disproportionately so; the heel is hairy, except along the middle line; the rest of the soles is naked, with six large tubercles among the smaller ones; those on opposite edges of the metatarsus are opposite each other.

The colors are the same as those of the dry skin.

Description of a dried skin, 632.—General form that of *S. cooperi*. Muzzle perhaps less elongated. Fur short, scarcely one and a half lines long. Ears of moderate size, though not quite as long as the adjacent fur. The feet are small, though rather broad; the former contained not quite one and two-third times in the latter, which is about five-eighths as long as the

skull. The soles have the large tubercles of *S. platyrhinus*, but the three central toes are less elongated, so that the first and fifth claws reach a little beyond the penultimate articulation of the adjacent toes instead of falling short, as in the allied *S. personatus* and *S. cooperi*. The tail is about as long or longer than the body, exclusive of the head; the vertebræ, as well as the tail itself, considerably shorter than in *S. platyrhinus*. It is well covered with hair, and tipped with a conspicuous pencil.

The upper parts strongly resemble those of *S. cooperi* and *S. personatus*, being of an olive chestnut brown; beneath, of a dull rusty white; the tail beneath and the feet a little paler. There is a decided hoariness on the back and sides, however, varying the reddish brown considerably, and caused by a greyish tinge to the hairs near the tip.

The skull is considerably attenuated anteriorly, and the dental formula, $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. The teeth are large; the anterior incisor well developed, with a large basal hook, as large and coming down as far as the first two lateral teeth. These are of equal size and twice as large as the third, which comes up close to the first molar. The fourth lateral tooth is very small, and only visible from inside. The lower anterior incisor is large, and has two large lobed dentations. Its posterior extremity reaches to the first molar. The tips of the teeth are all colored, to a considerable degree, of a rather dark chestnut.

Measurements.

Current number.	Locality.	Sex.	From tip of Nose to—				Tail to end of—		Length of—		Ear.	Skull.			Nature of specimen.
			Eye.	Ear.	Occiput.	Root of tail.	Vert.	Hairs.	Hand.	Foot.		Length	Width of jaw.	Length of palate.	
1688	Racine ---	♂	33	56	79	2.00	1.36	1.36	22	40	21	-----	-----	-----	In alcoho.
632	---do---	♂	-----	-----	75	1.75	1.10	1.20	22	35	----	63	16	22	Dry skin.

This species bears a close resemblance to *S. cooperi* and *personatus*, although readily distinguishable by several excellent characters. The skull, although slender anteriorly, is decidedly shorter, owing to the fact of there being one lateral tooth less and no interval in front of the first molar. The palate is considerably shorter. The teeth are still larger; the anterior incisor nearly twice as large; the lateral teeth narrow and descending more; the molars broader. The lower anterior incisor has but two dentations, instead of three. The teeth, generally, besides being larger, are more extensively and deeply colored than in the above mentioned species. The tail is about as large as that of *S. personatus*—considerably shorter than in *S. cooperi*. The feet, especially the hinder, are, however, very appreciably shorter; and the three central toes projects less beyond the lateral. The colors are much the same, except that there is rather more hoariness in the present species. (The above comparison with *S. cooperi* has been made chiefly with a specimen from the same locality, viz: Racine, Wisconsin.)

SOREX THOMPSONI, Baird.

Sp. Ch.—Very small and slender. Ears large, about as long as the fur, which measures $1\frac{1}{2}$ lines. Feet very small and slender; hinder ones barely exceeding four lines. Tail shorter than the body, exclusive of head; terminated by a pencil. Only four lateral teeth above, the third in contact with the first molar. Anterior upper incisor with a serrated internal lobe near the point.

Color above, dark olive-brown, slightly hoary; paler on sides. Beneath, ashy white. No tinge of chestnut or reddish brown. Length, 2 inches. Tail, $1\frac{1}{2}$.

Description of a Specimen in Alcohol, No. 1686.—Size very diminutive; body slender. Head narrow, pointed, though the muzzle is broad, depressed, and the tip naked and bilobed. The ear opening is large, the antitragus, helix, and concha, well developed; their edges well margined with hairs; the concha is nearly as long as the adjacent hair.

The tail is slightly constricted at the base, rather thin throughout, and appears depressed; it is well covered with hair concealing the annuli, and ends in a distinct pencil. It is about as long as the body, exclusive of the head.

The feet are very diminutive; the posterior measuring but 0.35 of an inch, and a little broader than the anterior; their soles appear hairy for the posterior third, but there is a narrow naked central line only overlapped by the hairs; the six plantar tubercles are very large and conspicuous among the smaller ones. There is no distinct ciliation to the feet.

The color above is an olive-brown, with a hoary intermixture, caused by a lighter penultimate annulus to the hair. Beneath, ashy white; a faint yellow-brownish tinge under the throat. Feet and under surface of the tail, whitish. Teeth of a deep pitchy chestnut color almost to the roots.

Measurements of 1686.

	Inches.		Inches.
Nose to eye.....	. 27	Tail to end of hair.....	1. 27
Nose to ear.....	. 55	Fore foot.....	. 21
Nose to occiput.....	. 72	Hind foot.....	. 36
Nose to root of tail.....	1. 70	Ears from anterior base to most remote point....	. 22
Tail to end of vertebræ.....	1. 12		

Weight, 21. 984 grains.

Description of a dried skin.—Body very slender. Snout much elongated. Ears quite large, with a considerable naked region about the meatus, although the ears are moderately well furred elsewhere. They are nearly or quite as long as the fur, which, on the back, measures about one and a half lines. The feet are very small, short, and narrow, absolutely less than in any species examined by me; the anterior contained a little over one and a half times in the hinder ones. The lateral claws behind attain the penultimate articulation of the adjacent toes.

The tail is a little less than the body exclusive of the head; it is very slender, well furred, and ends in a pencil of bristly hairs.

The upper parts are of a dark olive-brown, without any tinge of a reddish or chestnut, the sides are a little paler. The under parts are of a dark ashy-white, likewise without any tinge of rusty or yellowish. The difference in color between the back and belly is well marked. The feet and under surface of the tail are brownish white. There is a slight hoariness on the back produced by the lighter shade on the hairs near their points.

Owing to its mutilation, the exact length and proportions of the entire skull cannot be ascertained. Dental formula $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. The teeth are quite large; the basal hook of the anterior upper incisor about as large as the third lateral tooth, which is somewhat less than the first and second, themselves equal. The third tooth touches the first molar and thus conceals the small fourth tooth when viewed laterally. The lower anterior incisor has no lobes or dentations in No. 247, while two of them are more or less distinctly indicated in Nos. 2062 and 1686.

Measurements of No. 247, (dried skin,) probably stretched.

	Inches.	Lines.
Nose to root of tail.....	2.	0
Tail to end of vertebræ.....	1.	1
Tail to end of hairs.....	1.	3
Hand from wrist		. 2½
Foot from heel.....		. 4½
Length of bony palate		. 2½
Width of upper jaw		. 1½

This species is the smallest that has yet come under my examination, one specimen weighing less than 22 grains. It is readily distinguishable by its olive-brown color and small number of lateral incisors, as well as diminutive feet, from *S. personatus* and *cooperi*. In form it resembles *S. hoyi*, but is much smaller in size and proportions, much darker in color, has larger ears, less dentations on the lower anterior incisors, &c. It is barely possible that the two may be the same, but of different ages and seasons; but their differences are considerable, and both appear perfectly adult in all points.

As this species appears to be undescribed, I have named it after the late Professor Zadock Thompson, of Vermont, one whose recent death has caused a gap in the ranks of local scientific investigators, not soon to be filled.

List of Specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
1686	-----	Burlington, Vt.	Prof. Z. Thompson.....	In alcohol.....
247	3099	Zanesville, Ohio.....	A. C. Ross.....	Skin.....
2062	3098	Halifax, N. S.	Dr. J. B. Gilpin	do.....

BLARINA, Gray.

Blarina, GRAY, Pr. Zool. Soc. London, 1837.*Brachysorex*, DUVERNOY, Mag. de Zool. 1842.*Talpasorex*, LESSON.*Cryptotis*, POMEL, 1848.*Anotus*, WAGNER, 1855

Body stout; tail shorter than the head, or nearly equal to it, coated with short bristly hairs, and a small brush at the tip. Hands large in proportion to the feet; palms as broad or broader than the soles. Soles usually hairy at the heels. Fore claws longer than the hinder ones. Ears small, the antitragus and antihelix more developed than the helix, all directed forward and closing the meatus, so as to exhibit no opening nor any external ear whatever. Skull short and broad; truncated at tip and much less attenuated anteriorly than in the eared shrews. The anterior upper incisor, with the points simple, or without an internal lobe; the teeth rarely in contact. Lower angular process of lower jaw rather stout and short.

The short-tailed American shrews constitute what appears to be a very natural genus, entirely different from any inhabiting the old world. The short tail not longer than the head, and the apparently total want of ears are among the most striking external features. In the natural state it requires close examination to ascertain where the ear is situated, as it is directed completely forward and applied against the entire meatus like a valve.¹ The hair on what is thus the external surface of the ear is equally dense with that on the rest of the head and of the same length. It is this peculiarity that has caused authors to describe some of the species as without ears, especially *Sorex carolinensis* of Bachman, upon whose description Wagner has made a subgenus *Anotus*, and others *Cryptotis*. There is, however, no difference in this respect in all the short-tailed species, and the above names are strictly synonymous with *Blarina* of Gray, and *Brachysorex* of Duvernoy.

The species of *Blarina*, like those of *Sorex*, are divisible into two sections, according as the teeth are 32 or 30 in number; in the former case there are five premolars, in the latter there are four. The formula of the first section is incisores, $\frac{1-1}{1-1}$; premolars, $\frac{5-5}{2-2}$; molars, $\frac{4-4}{3-3} = 32$; of the second in., $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{2-2}$; molars, $\frac{4-4}{3-3} = 30$. In no American shrew of this genus, or any other, have I found fewer than 30 teeth, or more than 32.

In the following diagnoses are given more in detail the peculiar characters of each section:

SECTION A, WITH FIVE UPPER PREMOLARS.

Color, a nearly uniform plumbeous on body and tail; scarcely lighter beneath. Dental formula $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$ teeth. The upper anterior incisor with the basal portion of the cutting edge formed by a nearly rectangular lobe, the entire tooth forming only a single hook. The first two premolars are nearly equal, the second usually a little larger; the next two much smaller; the fifth very small, and usually not visible externally. The first four with a small basal colored point on the inner side. Lower anterior incisors stout, much curved, with two or three lobed dentations. The first and second premolars are placed above this incisor, which even extends back as far as the middle of the first molar. Hands contained about one and a third times in the hind feet.

¹ Throughout the article on *Sorex* I have erroneously used the term *concha* to indicate the flap of the ear, instead of *auricle*, and *helix* instead of *antihelix*.

SECTION II, WITH FOUR UPPER PREMOLARS.

Lower parts of the body and tail usually lighter than the upper, with the line of demarcation distinctly visible. Feet smaller than in Section A; the anterior contained about one a half times in the posterior. Dental formula $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. Anterior upper incisor with the basal lobe more conical and further forward than in the other section. The first premolar tooth slightly larger than the second. The third decidedly smaller than either, though larger than in the other group. The small cusp on the inner side of the base of the first three lateral teeth, either wanting or very small. Lower anterior incisor with two or three lobed serrations, stout, much curved, not reaching posteriorly as far as the middle of the first molar; the two first lateral teeth entirely above it.

A—WITH FIVE PREMOLARS, TEETH 32.

BLARINA TALPIOIDES.

Sp. Ch.—Very large. Fur rather short, coarse, about $2\frac{1}{2}$ lines long. Feet shorter than in *B. brevicaudus*; tail about the length of the head.

Color above, dark ashy gray, with a wash of light sooty brown; sometimes clearer, with a slight hoariness. Average length of head and body, $3\frac{1}{2}$ inches; tail and head, one inch. Fore foot, 0.40; hind foot, 0.55 of an inch. Skull about 0.85 of an inch long.

Sorex talpoides, GAPPER, Zool. Jour. V, June 1830, 208, pl. viii. (Lake Simcoe, Canada.)

Corsira (Blarina) talpoides, J. E. GRAY, Pr. Zool. Soc. Lond. V, Nov. 1837, 174.

Sorex Dekayi, BACH, J. A. N. Sc. Ph. VII, 1837, 377; pl. xxiii, f. 4.

DEKAY, N. Y. Zool. I, 1842, 17; pl. v. f. 2.

AUD. & BACH, N. A. Q. III, 1853, 246; pl. cl, f. 2. (Original description.)

? *Sorex brevicaudus*, HARLAN, Faun. Amer. 1825, 29. (Skull only.)

? THOMPSON, Hist. Vermont, 1842, 27.

? DEKAY, N. Y. Zool. I, 1842, 19.

? PLUMMER, Am. Jour. Sc. XLVI, 277. (Habits.)

? *Brachysorex brevicaudus*, DUVERNOY, Mag. de Zool. 1842; pl. lii.

? *Sorex carolinensis*, DEKAY, N. Y. Zool. I, 1842, 21; pl. xxi, f. 2.

Description of a Specimen in Alcohol, (No. 2087,) from *Massachusetts*.—The form of this animal is thick and mouse-like; very different from the proportions of the European shrews, or the long-tailed American species. The head is short, broad, and much depressed, the lateral profile narrower than the superior. The width of the head, seen from above, is from 0.57 to 0.60 its length, and tapers in nearly a straight line to the truncated muzzle. This is broad, naked, and deeply furrowed in the middle vertical plane; the nostrils open on the sides and occupy most of the lateral surface. The under side of the muzzle is deeply furrowed from the upper incisor to the median furrow of the nose. The upper incisors are placed about midway between the posterior angle of the mouth and the tip of the nose, thus illustrating the unusual brevity of the snout.

The eyes are excessively minute, and require a close scrutiny to detect their presence; the opening in the skin through which they are seen, not larger than a small pin-hole. They are nearer the anterior base of the ear than the muzzle, and only a very little anterior to a point midway between the tip of the muzzle and the occiput.

The opening of the ear is quite large, but the whole external ear is directed entirely forwards, closing the meatus like a valve, and forming no projection whatever, so that in the dried skin

this member appears entirely wanting. On lifting it, however, the antitragus and antihelix are found to be well developed; the upper portion of the latter even higher than the helix. The auricle, as stated, is directed entirely forward, and fits neatly and exactly against the entire opening of the ear. It is altogether naked on its concavity; posteriorly, and on the edge, densely furred. There is also a ciliation of hairs on the edges of the antitragus and antihelix. The entire external ear has the membranes unusually thick.

The feet are broad, the anterior especially, which are as wide or even wider than the posterior. The fore claws are twice as long as the hinder. The hand itself is as long as the foot, from heel to end of metatarsus. The hind foot is about half as long as the head. Both fore and hind feet are thinly furnished with hairs on their upper surface, which do not conceal the prominent scutellæ. The palm is naked, with six large tubercles; the sole is also naked, with six tubercles, although the hairs overgrow the heel somewhat from the sides, leaving a narrow, naked, central line.

The tail is very short, thick, slightly constricted at the base, and of nearly uniform size to the extreme tip; it is quite thickly clothed with hairs, so as almost to conceal the annuli, and terminates in a decided pencil. With the hairs, it is about as long as the head, and a little more than twice the length of the hind foot.

The longest hairs on the back measure about 0.30 of an inch. These vary, however, with the season.

Head, 1.05 inches; head and body, 3.20; tail, vertebræ, 0.90; tail, hairs, 1.00; fore foot, 0.38; hind foot, 0.55.

The preceding description is taken from a specimen in alcohol, from Massachusetts, as illustrating the external conditions of the animal, and corresponding well with the *S. dekayi* of authors. In order, however, to exhibit more fully the probable identity of this species with the *S. talpoides* of Gapper, I subjoin the description of a skin from near Montreal, a locality not essentially remote from that of Gapper's specimen.

Body cylindrical, covered with rather short, close hair. Snout elongated, flattened above, much tapering; truncated at tip, which alone is naked and bilobed. Nostrils lateral, somewhat elongated longitudinally in the dried specimen, but nearly circular when fresh or even sub-ventral. Eyes very minute, appearing as a mere speck. Ear with the aperture large, but completely hidden in the dried skin, the animal appearing entirely destitute. The external ear is a mere flap, bilobed and situated entirely infero-posteriorly. The feet are rather small; the anterior nearly as long and rather broader than the posterior, with decidedly longer claws. All are sparingly coated with hairs on the upper surface, so as not to conceal the scaly character there visible. The palms are naked, with transverse wrinkles under the fingers, and several tubercles; the soles are similar, though scantily coated with hairs towards the heel. The third finger is longest; the fourth scarcely shorter; next the second; the cleft between the second and third deepest. The claw of the fifth reaches to the end of the finger of the fourth; that of the first about to the end of the finger of the fifth. In the hind foot the central three toes are nearly equal. The first and fifth spring out some distance behind the others; the former shortest, the latter not reaching to the base of the fourth claw. The tail is short, cylindrical in the fresh specimen, covered with short annuli, having hairs springing between so as to nearly conceal them, and a distinct brush of hairs at the end.

The color of the species varies somewhat with the specimen. In the largest skin from Montreal, it is everywhere of a smoky brownish gray, slightly paler beneath. Feet whitish; claws

yellowish white; whiskers grayish; tail uniformly dusky. This is also the case with specimens from Massachusetts, Carlisle, Racine, and most localities generally. One specimen from Racine has much the same ground color, but intermixed are many hairs of a silvery grayish, imparting quite a hoary appearance. This is also seen in one specimen from Ann Arbor, Michigan, and is probably the winter condition of the pelage. A specimen from West Northfield, Illinois, has the chin and tip of tail white; the teeth are all colored at the ends, dark reddish or purplish brown, the tips of the long incisors nearly black; the small premolar is alone entirely white.

A specimen from Holmes' Hole, Massachusetts, (903,) belonging to the Boston Natural History Society, is of a very pale, brownish chestnut above, fading to the belly into a still paler tint of the same. The colors, however, are such as might be the result of a partial bleaching, especially of a specimen preserved in alcohol impregnated with corrosive sublimate, and exposed to the light. I have seen precisely this tint produced in moles, under the circumstances here supposed.

As it is a matter of much importance to define the characters of this species, the most abundant of the North American shrews, I have appended the following very full table of measurements to illustrate the variations in size and proportions to which it is subject.

Measurements. (A.)

	Grosse Ile, Wis. ♂ Alcohol.		Carlisle, Pa. Alcohol.		Montreal, (198.) Dried.	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to occiput			1			
Nose to eye		6		5 $\frac{3}{4}$		
Nose to ear		10		8 $\frac{1}{2}$		
Nose to root of tail	3	4	3	2	4	4
Nose to end of outstretched hind legs	4	3				
Tail from root to end of vertebræ		11		11	1	2
Tail from root to end of hairs	1	1 $\frac{1}{2}$	1	$\frac{1}{2}$	1	4 $\frac{1}{2}$
Ears, width of aperture		3		3		
Arm, fore foot to end of claws		5		5 $\frac{1}{4}$		5 $\frac{1}{2}$
Arm, longest claw		1 $\frac{1}{4}$		1 $\frac{1}{4}$		
Leg, hind foot from heel to end of claws		6 $\frac{1}{2}$		6 $\frac{1}{2}$		7 $\frac{1}{2}$
Leg, longest claw		$\frac{3}{4}$				

Measurements. (B.) Specimens all in alcohol.

No.	Locality.	Sex.	From tip of the nose to—				Tail to end of—		Length of—		Breadth of—	
			Eye.	Ear.	Back of the head.	Root of tail.	Verteb.	Hairs.	Hand.	Foot.	Hand.	Foot.
2065	Middleboro', Mass.-----	♂	0.42	0.74	0.95	2.95	0.84	1.01	0.36	0.55	0.18	0.16
2066	-----do.-----	♂	0.40	0.75	0.97	3.04	0.79	1.13	0.35	0.51	0.13	0.14
2067	-----do.-----	♀	0.44	0.70	0.99	3.30	0.87	1.02	0.42	0.51	0.15	0.16
2068	-----do.-----	♂	0.41	0.75	1.02	2.66	0.83	1.10	0.36	0.53	0.18	0.16
2069	-----do.-----	♂	0.44	0.74	1.01	3.02	0.97	1.20	0.37	0.56	0.17	0.16
2071	-----do.-----	♂	0.43	0.79	1.03	3.09	0.97	1.14	0.37	0.52	0.18	0.12
2072	-----do.-----	♀	0.45	0.71	1.00	2.86	0.94	1.05	0.30	0.50	0.14	0.12
2073	-----do.-----	♂	0.50	0.74	0.95	3.08	0.79	1.06	0.35	0.51	0.16	0.13
2074	-----do.-----	♂	0.50	0.74	1.05	3.10	0.94	1.15	0.33	0.46	0.16	0.15
2075	-----do.-----	♂	0.40	0.68	0.97	2.73	0.83	0.97	0.35	0.50	0.16	0.16
2076	-----do.-----	♀	0.49	0.74	1.03	3.17	0.82	1.10	0.30	0.54	0.19	0.15
2077	-----do.-----	♂	0.43	0.73	1.02	2.75	1.00	1.10	0.38	0.52	0.18	0.17
2078	-----do.-----	♀	0.49	0.88	1.06	3.65	0.90	1.13	0.38	0.53	0.18	0.14
2079	-----do.-----	♀	0.41	0.76	1.14	2.85	0.96	1.07	0.40	0.54	0.16	0.15
2080	-----do.-----	♂	0.50	0.70	1.14	3.08	0.93	1.11	0.30	0.54	0.15	0.15
2081	-----do.-----	♂	0.49	0.81	1.11	2.92	0.93	1.03	0.38	0.57	0.15	0.15
2082	-----do.-----	♂	0.50	0.80	1.10	2.71	0.88	0.94	0.40	0.53	0.15	0.15
2083	-----do.-----	♂	0.41	0.80	1.09	3.35	0.99	1.15	0.42	0.53	0.15	0.15
2084	-----do.-----	♂	0.45	0.65	1.02	3.06	0.88	1.13	0.38	0.50	0.16	0.15
2085	-----do.-----	♀	0.43	0.73	1.11	2.90	0.89	1.12	0.36	0.55	0.15	0.15
2086	-----do.-----	♂	0.40	0.70	1.04	2.83	0.95	1.18	0.34	0.50	0.15	0.14
2087	-----do.-----	---	0.49	0.75	1.05	3.20	0.90	1.00	0.38	0.55	0.15	0.15
2126	Muskeget, Mass.-----	---	0.52	0.78	1.00	3.21	1.00	1.30	0.41	0.55	-----	-----
2127	Burlington, Vt.-----	♀	0.51	1.00	1.25	3.15	0.90	1.05	0.36	0.55	-----	-----
2128	Wethersfield, Conn.-----	♂	0.55	0.95	1.20	3.30	0.95	1.15	0.42	0.62	-----	-----
2129	Essex county, N. Y.-----	♂	0.56	0.92	1.25	3.36	0.92	1.05	0.40	0.55	-----	-----
2130	-----do.-----	♂	0.55	0.90	1.10	3.40	0.96	1.12	0.41	0.56	-----	-----
2131	-----do.-----	♀	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2132	Nichols, N. Y.-----	---	0.54	0.80	-----	3.00	0.90	1.10	0.40	0.53	-----	-----
2133	-----do.-----	---	0.50	0.88	1.10	3.35	0.68	mutilated	0.40	0.55	-----	-----
2134	Waterville, N. Y.-----	---	0.55	0.90	1.15	3.30	0.90	1.00	0.40	0.55	-----	-----
2135	-----do.-----	---	0.50	0.90	1.15	3.30	0.85	-----	0.40	0.55	-----	-----
2136	-----do.-----	---	0.46	0.70	-----	3.30	0.85	1.05	0.35	0.50	-----	-----
2137	-----do.-----	♀	0.55	0.82	1.18	3.45	0.98	1.12	0.45	0.60	-----	-----
2138	-----do.-----	---	0.55	0.85	-----	3.00	0.86	1.02	0.40	0.50	-----	-----
2139	Sag Harbor, N. Y.-----	---	0.49	0.71	1.05	2.75	0.82	0.90	0.38	0.50	-----	-----
2140	Salem, Ohio.-----	♀	-----	-----	-----	3.50	0.70	0.80	0.36	0.54	-----	-----
2141	-----do.-----	---	0.55	0.75	1.16	3.55	1.05	1.25	0.41	0.56	-----	-----
2142	-----do.-----	---	0.50	0.85	1.10	3.20	0.85	1.10	0.40	0.55	-----	-----
2143	-----do.-----	---	0.52	0.80	1.10	3.10	0.85	1.05	0.38	0.53	-----	-----
2144	Lake Superior.-----	---	0.50	0.75	1.11	3.00	1.05	1.15	0.40	0.47	-----	-----
2145	Detroit.-----	♂	-----	-----	-----	3.50	0.80	1.00	0.40	0.55	-----	-----
2146	W. Northfield, Ill.-----	---	-----	-----	-----	3.65	0.88	1.20	0.42	0.60	-----	-----
2147	-----do.-----	---	0.50	0.77	1.08	2.80	0.75	0.96	0.35	0.54	-----	-----
2148	-----do.-----	---	-----	-----	-----	-----	0.77	0.86	0.36	0.52	-----	-----
2149	Carlisle, Pa.-----	---	0.49	0.74	1.05	3.25	0.95	1.10	0.40	0.55	-----	-----
2150	Columbus, Ga.-----	---	0.50	0.85	1.10	3.35	0.80	1.00	0.40	0.57	-----	-----
2151	Spottsylvania county, Va.-----	---	0.45	0.77	1.05	2.75	0.80	0.90	0.35	0.50	-----	-----

With a very large number of specimens before me, I have been more than usually perplexed in the attempt to determine the species of short-tailed shrews, as given by authors, and especially to distinguish between *S. brevicaudus* and *S. dekayi*, of Bachman, Dekay, and others. I am satisfied that the latter species is identical with *S. talpoides*, of Gapper, (which indeed has priority of date,) having found no essential difference between Canadian specimens and those from Massachusetts, Vermont, New York, Michigan, Wisconsin, and elsewhere. Gapper's specimen, it will be remembered, was taken in the district between York and Lake Simcoe, in Upper Canada.

Thus far I have not been able to find any shrews from Massachusetts, New York, or the adjoining States, possessing all the characters assigned by Bachman and Dekay. The hair of the same species varies with season, being longer, softer, and fuller in winter; the precise shade of color is likewise not constant. The proportions of the shrews unless taken from alcoholic, or fresh specimens, vary exceedingly in the same species, according as the skin is under or over stuffed.

For the present, therefore, I shall refer all the large shrews with short tails, from the Atlantic States, to the *S. talpoides*. I have, however, before me some specimens from the Upper Missouri and Iowa, which, as they differ in size from any in the East, and agree rather more nearly with the *S. brevicaudus*, of Say, I shall refer to this species.

The accompanying tables of measurements of many specimens, in alcohol, will illustrate the variations of proportions, even in animals from the same locality and almost the same nest.

Nor do I feel sure that the *Sorex carolinensis*, of Bachman, is really anything else than a small *S. talpoides*. The measurements given by him (length 3 inches) agree precisely with many from Massachusetts and elsewhere, and are essentially the same in proportion with those of the largest sized specimens of *S. talpoides*. The number of teeth (34) assigned by him, is unquestionably a mistake, as no known shrew, from any part of the world, has so many. There is, however, a distinct species in the Southern States, considerably smaller than *S. talpoides*, to which Bachman's name may be applied.

The geographical range of *S. talpoides*, as will appear from the preceding table of localities, is very great, extending from the eastern portion of Nova Scotia to Lake Superior, and including Canada, Vermont, Ohio, Michigan, Illinois, and Wisconsin, and southward through Massachusetts, Connecticut, New York, Pennsylvania, and Virginia, to Columbus, Georgia. South of Pennsylvania it is probable that it is confined to the vicinity of the mountains, as it has not yet been detected near the coast nor west of the Alleghanies, where its place is supplied by the smaller *S. carolinensis*.

List of specimens.

Catalogue number.	Corresponding No. of skull.	No. of specimens.	Locality.	Whence obtained.	Nature of specimen.
198	1770	1	Montreal	Thomas Broome.....	Skin.....
		1	Halifax, N. S.	J. W. Dawson.....	do.....
1647		1	Hingham, Mass.....	Dr. Brewer	do.....
2126		1	Muskeget, Mass.....	do.....	Alcohol ..
902	1950	1	Holmes' Hole, Mass.....	Boston Society Natural History..	Skin.....
		13	Middleboro', Mass.....	J. W. P. Jenks.....	do.....
2065 to 2125		60	do.....	do.....	Alcohol ..
2127		1	Burlington, Vt.....	Prof. Z. Thompson.....	do.....
1317	2119	1	do.....	do.....	Skin.....
? 2129			Wethersfield, Conn.....	C. Wright.....	Alcohol ..
2132-3		2	Nichols, N. Y.....	R. Howell.....	do.....
2134-38		5	Waterville, N. Y.....	H. Davis.....	do.....
2139		1	Sag Harbor, N. Y.....	E. N. Byram.....	do.....
2140-3		4	Salem, Ohio.....	E. Newton.....	do.....
817-8		2	Cleveland, Ohio.....	Dr. Kirtland.....	Skin.....
246		1	Ann Arbor, Mich.....	Prof. C. Fox.....	do.....
2145			Grosse Isle, Mich.....	do.....	Alcohol ..
2146-8, 2162-3		5	Cook county, Ill.....	R. Kennicott.....	do.....
109, 625		2	Racine, Wis.....	Dr. Hoy.....	Skin.....
2164-5		2	do.....	do.....	Alcohol ..
2144		1	Lake Superior.....	Prof. Agassiz.....	do.....
2149		1	Carlisle, Pa.....	S. F. Baird	do.....
623	1774	1	do.....	do.....	Skin.....
1308	2010	1	Clarke county, Va.....	Dr. Kennerly	do.....
2154		1	Spottsylvania, Va.....	Mr. Massey	Alcohol ..
2150		1	Columbus, Ga.....	Dr. Gesner	do.....

BLARINA BREVICAUDA.

Sorex brevicaudus, SAY, Long's Exped. I, 1823, 164.

HARLAN, Faun. Amer. 1825, 29. (Skin only.)

GODMAN, Am. Nat. Hist. I, 1831, 79. (2d ed. From Say.)

WAGNER, Suppl. Schreb. V, 1855, 549. (From Say.)

BACHMAN, J. A. N. Sc. Ph. VII, 1837, 381.

AUD. & BACH. N. A. Quad. III, 1854, 335.

SP. CH.—Largest of all American shrews hitherto discovered. (?) Head very broad and massive; rather obtuse. Tail, with its hairs, about as long as the head, cylindrical, slightly depressed, well covered with hair, and terminated by a pencil. Under surface of heel more than usually hairy, with a narrow naked line on the inner edge.

Color, dark brownish plumbeous, scarcely paler beneath. Feet and edge of the lips, whitish. Length, unstretched, over 4 inches to root of tail. Hind feet, 0.65 long. Fore feet, .50 inch. Skull 1 inch in length.

In the preceding diagnosis, I have embodied nearly all I have to say concerning the form of the only alcoholic specimen before me, referable to the *B. brevicauda*. It is, unfortunately, too

much mutilated for accurate description. I can only add, that the longest hairs on the back measure about 0.35 of an inch.

The skull of this species is very large and massive, with little constriction in the middle portion. The occipital plane is more vertical than in *B. talpoides*. The anterior upper incisors are very massive, and there is only a slight indication of any basal lobe on the cutting edge. The second premolar is nearly twice as large as the first; the third and fourth abruptly much smaller, and nearly equal. Both together do not occupy as much space in the outline of the jaw as the one anterior to them. The fifth premolar is only visible from inside.

In order to illustrate the comparative dimensions of this species, I have given the same table the measurements of one of the largest specimens of *S. talpoides* I have yet seen, (No. 2078 ♀.) This, when skinned, could easily be made to measure four inches and over, from nose to root of tail.

Dimensions.

	2151.	1065.	2078.		2151.	1065.	2078.
Nose to eye.....	.55	-----	.49	Longest claw.....	.13	-----	.10
Nose to ear.....	.86	-----	.85	Hind foot.....	.65	.60	.53
Nose to occiput.....	1.22	-----	1.06	Longest claw.....	.10	-----	.6
Nose to base of tail.....	-----	4.25	3.65	Length of skull.....	1.00	-----	.88
Tail to end of vertebræ.....	1.00	-----	.90	Greatest width.....	.51	-----	.46
Hair.....	1.25	-----	1.11	Width of upper jaw.....	.32	.31	.29
Hand.....	.50	.45	.38	Length of palate.....	.43	.43	.35

I present here the description of a shrew from northern Wisconsin, which differs in some respects from *S. talpoides*, and may be referred to *S. brevicaudus*.

Brachysorex brevicaudus.—Size large. Fur long, (over $2\frac{1}{2}$ lines,) very soft and lustrous, lying flat to the body. Hand unusually large, measuring almost five lines; foot six and a half; tail about two-thirds the length of head.

Color, dark plumbeous, with a blackish gloss above, having sometimes a faint purplish reflection. No rusty brown tips or hoariness visible in the fur. Head and body, $3\frac{1}{2}$ inches; tail to end of hairs, 10 lines.

No. 708.—Body stout; nose acute, but broad; whiskers rather numerous, long, and whitish; ears small, with the concha but little developed, lapping over the meatus, concealed by the fur. Fur soft and silky, longest hairs about $2\frac{1}{2}$ lines. Tail very short, about two-thirds the length of the head; quadrangular in the dried specimens, and coated with rather long hairs, which form a pencil at the end. Feet more than usually large and stout, especially the anterior ones. These are broader, and have longer claws than the hind ones. The soles are naked, except at the heel; the first claw reaches the penultimate articulation of the second toe; the fifth claw nearly to the base of the fourth. The hand is contained only about one and a third times in the foot.

The prevailing color is a blackish plumbeous on the back and sides, dark plumbeous beneath; much the same everywhere, except a darker gloss above. There is sometimes a faint purplish gloss on the fur above. There is not the slightest trace of dull rusty brown. The hairs are dark plumbeous from their roots. The tail is everywhere like the back.

The cranium is too much mutilated to allow its shape to be determined, though the skull generally appears to be much like that of *B. talpoides*. The dental formula is $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$. The anterior incisors are large and acute, placed quite close to each other. There is no internal lobe, and there is no second hook at the base of the tooth distinct from the tip, as in some American species. There is, however, a sharp lobe at the base, nearly rectangular, with a slight angle in the anterior edge. The first two premolar teeth are much the largest; they are pyramidal acute, and like the basal lobe of the anterior, with a small process in the inner side. The third and fourth lateral teeth are much smaller than the first and second, simply acute; the fourth nearly twice the third, and separated by a slight diastema from the first molar; the fifth tooth is very small, but visible from outside. The lower incisors are large, thick, and much curved, with two lobes on the upper edge. All the teeth have their crowns and points of a deep pitchy black, especially towards the latter.

Measurements of 708.

	Before skinning.		Dried.
	<i>Inches.</i>	<i>Lines.</i>	
Nose to root of tail.....	3	6	3. 1
Tail to end of vertebrae.....			. 8½
Tail to end of hairs.....		10½	. 10
Fore feet from wrist.....			. 4½
Hind feet from heel.....			. 6½
Width of palm.....			. 1½
Width of upper jaw.....			3½

The specimen 2152, from the Little Blue creek, Nebraska, agrees very well with this specimen, more so than with those from Fort Berthold and Iowa. The same may be said of the number 2063 from Illinois.

I have found very great difficulty in identifying with any certainty the *Sorex brevicaudus* of Say, at least in the references to this species, as supposed to be found in the eastern portion of the continent. I have, however, I think, discovered it in some specimens of very large size from Nebraska and Iowa, localities nearer to that of the original specimen (Council Bluffs) than of any specimens yet described. As most of Say's descriptions of vertebrata in Long's narrative were taken before the animals were skinned, the measurement from tip of nose to root of tail of 3½ inches, or 3.62, must be considered as indicative of a size greater than usual in the *S. talpoides* (or *dekayi*), in which these dimensions are only once or twice noted in measurements of about one hundred specimens.

The shrews in question are not only larger in body than any seen from the eastern States, but there is a very conspicuous superiority in the size of their skulls, a point of great importance in this group. The only specimen in alcohol is unfortunately too much mutilated to furnish a true length, but it is proportionally much larger than the largest fresh specimen I have ever seen from the east, as will be seen by the comparative table of measurements.

List of Specimens.

Catalogue Number.	Corresponding No. of skull.	Sex & Age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Collected by
2151	-----	-----	Fort Berthold, N. T.	1856	Lt. G. K. Warren	-----	In alcohol.	F. V. Hayden
2152	-----	-----	Little Blue R., N. T.	-----	Lt. F. T. Bryan	71	do	W. S. Wood.
? 1065	2025	-----	Ft. Des Moines, Iowa	-----	Geo. N. Lawrence	-----	Skin	W. E. Moore.
? 1573	2413	-----	Plum Spring, Iowa.	-----	B. F. Odell	-----	do	-----
? 2063	-----	-----	West Northfield, Ill.	-----	R. Kennicott	-----	do	-----
? 708	3104	♀	Dane county, Wis.	-----	The. Kümlien	-----	do	-----

BLARINA CAROLINENSIS.

Sorex carolinensis, BACHMAN, J. A. N. Sc. Phil. VII, 1837, 366; pl. xxiii, f. 1.

AUD. & BACH. N. A. Quad. II, 1851, 176; pl. lxxv. (Same description as preceding.)

Sorex (Anotus) carolinensis, WAGNER, Suppl. Schreb. V, 1855, 554.

SP. CH.—Size rather small. Fur soft and rather long, measuring $2\frac{1}{2}$ lines. Feet smaller than in *B. talpoides*. Tail rather shorter than the head.

Color dark-lead gray, a little paler beneath, with a slight gloss of sooty brown above, and a little hoariness. Head and body about 2.50 inches. Tail $\frac{3}{4}$ of an inch. Hind foot .46 of an inch. Skull about .76.

Size considerably less than adults of *B. talpoides*. Body stout. Feet large. Nose moderately pointed. Ears small, much as in *B. talpoides*, concealed by the fur. Fur rather full and long; hairs on the back measuring two and a half lines. Hand large, broader than the foot, its claws considerably longer; contained about one and a third times in the hinder one. Soles naked except on the sides of the heel. Tail short, rather less than the head, with short bristly hairs forming a pencil at the tip.

Color above, a dark-lead gray, a little paler beneath, with a faint gloss of dark, sooty brown on the tips of the hairs above, and a very slight hoariness produced by a paler bar near the tips of the hairs above, (not noticed in No. 628.)

The skull is thick and short, not much attenuated anteriorly. Dental formula, $\frac{2}{2} + \frac{5-5}{2-2} + \frac{4-4}{3-3} = 32$. Anterior upper incisors approximate, but do not touch. No basal hook, but an angular lobe. First premolar tooth but little smaller than the second. The third and fourth considerably smaller; the latter rather less of the two and not descending so low, placed close to the first molar; the fifth tooth wedged in between their inner portions. All these teeth, except the fifth, with an internal lateral basal knob. The first two premolars, though more than twice as wide as the next two, are not much longer. The lower anterior incisors are stout and much curved below, with three lobed dentations on the cutting edge. The crowns and points of the teeth are colored dark chestnut-brown, nearly black at the tips. The outside of the upper molars is, however, mostly uncolored.

Measurements of skins.

Current number.	Locality.	Sex.	Point of nose to—				Tail to end of—		Hand.	Foot.	Nature of specimen.
			Eye.	Ear.	Occip.	Root of tail.	Verteb.	Hairs.			
619	Society Hill, S. C. °		-----	-----	-----	-----	71	82	34	46	Skin.-----
627	St. Louis, Mo. °	♂	-----	-----	92	2. 75	71	75	31	46	..do-----
628	do-----		-----	-----	.83	2. 50	75	83	32	46	-----
2153	Union county, Mo.-----		43	68	90	2. 50	85	90	35	45	Alcohol---

° The first four measurements of 628 and 627 were taken before the animals were skinned.

Measurements of skulls.

	1809	1778	1779
Length of skull.-----	-----	.75	.79
Greatest width.-----	-----	.39	.41
Least width.-----	-----	-----	-----
Length of palate.-----	.33	.33	.36
Width of upper jaw.-----	.24	.25	.25

This species differs from *B. brevicauda* in the considerably smaller size, smaller hands, longer tail, the colors not very dissimilar; with somewhat the proportions of *B. talpoides*, the size is much less; the third and fourth lateral teeth larger in proportion to the first and second, &c. The feet are considerably smaller in proportion.

The specimens as above given agree in the main very well with each other, and as indicating a southern species, smaller than *B. talpoides* or *brevicauda*. I have referred them to the *Sorex carolinensis* of Bachman. I am by no means clear, however, that the particular measurements cited by him do not belong really to a specimen of *B. talpoides*, but he undoubtedly was acquainted with a species smaller than the latter. In assigning a dentition of 34 teeth, or of incisors $\frac{1-1}{1-1}$, premolars $\frac{5-5}{2-2}$, molars $\frac{5-5}{3-3}$, or one more molar on either side of the upper jaw than I have given, he in all probability was in error, as in no carefully examined skull of any species of shrew, from any part of the world, have the teeth ever exceeded 32. Dekay goes beyond even Bachman, in counting 36 teeth, or incisors $\frac{1-1}{1-1}$, premolars and molars $\frac{10-10}{6-6}$, thus committing a still greater error.

It is probable that the teeth of the skulls examined by Bachman and Dekay were either badly cleaned, or else still in the skin, and seen so imperfectly that two cusps of the same molars were counted as different teeth.

This character of 34 teeth, combined with the statement of an entire absence of ear, have caused the erection of several genera to accommodate the *Sorex carolinensis* of Bachman. Thus, Pomel has *Cryptotis*, and Wagner, *Anotus*; both, however, strictly synonymous with *Blarina* and *Brachysorex*.

I am very much at a loss to identify the *Sorex carolinensis* of Dekay, (N. Y. Zool. I, 1842, 21; pl. xxi, f. 2). In this the length is given at 4 inches for head and body, and 0.4 of an inch for the tail, or not half as long as the head; teeth, 36. It certainly is not the true *Sorex carolinensis*. If these characters are really as given by Dekay, it certainly is one of the most remarkable of all American shrews, and is not only a new species, but will probably constitute a new genus. I am inclined to think there is some mistake, however, as according to the figure the tail measures nearly one inch to a body of about $2\frac{1}{2}$.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	Whence obtained.	Nature of specimen.
619	1809	-----	Society Hill, S. C.-----	Rev. M. A. Curtis-----	Skin-----
627	1778	♂	St. Louis, Mo-----	Dr. Engelmann-----	do-----
628	1779	-----	do-----	do-----	do-----
2153	-----	-----	Union county, Mo-----	Dr. P. R. Hoy-----	In alcohol---

BLARINA ANGUSTICEPS, Baird.

SP. CH.—Tail as long as the head; general appearance that of *B. talpoides* and *carolinensis*, intermediate between them in size. Plumbeous all over, scarcely paler beneath. Skull unusually narrow, the constriction greater than in others of the section, and more anterior. Fifth upper premolar large, and visible from outside; anterior lower incisor extending back only to the middle of the second premolar. Length, 2.60; tail, (hairs,) 1.00; hind foot, 0.55.

A shrew from Burlington, Vermont, in external appearance, perfectly resembles specimens of *S. talpoides*, but has some remarkable peculiarities of the skull. This is much narrower than in any short-tailed shrew I have ever seen, and the greatest interorbital constriction is situated a little anterior to the middle of the skull, instead of posterior to it, as in other species of *Blarina*. The amount of constriction is also greater. The outline of the jaw outside of the molars, as viewed from above, instead of being convex is nearly straight. The inequality between the third and fourth upper premolars, and the first and second, is less conspicuous, and the fifth premolar is distinctly visible from the side between the fourth premolar and the first molar; indeed, in size it is not much inferior to the former. The lower anterior incisor is long, acute, and with one lobe on the cutting edge. It extends posteriorly only as far as the centre of the second premolar, instead of to the first molar. The lower jaw is rather narrow.

In many respects this skull closely resembles the true *Sorex*, as in the narrow skull, small molars, backward extent of lower anterior incisors, &c., but is nevertheless a true *Brachysorex* or *Blarina*, having no internal lobe to the upper anterior incisor; the short tail, &c. It constitutes a very interesting connecting link between the two groups. I regret that I cannot give any satisfactory external characters by which to designate this species, especially as the skull is so entirely different from all other I have seen; enough so to almost make a distinct sub-genus. It is nearly uniformly bluish gray all over, with a wash of brown on the back; the feet and tip of the tail are white. This latter feature is not characteristic, however, as I have seen it in other species.

$\frac{1318}{2520}$, Burlington, Vt., Prof. Z. Thompson, (skin.)

Nose to occiput ^o	1. 00	Foot	. 55
Nose to root of tail	2. 58	Length of skull	. 85
Tail, vertebrae	. 83	Width	. 40
Tail, with hairs	1. 00	Width of jaw	. 20
Hand	. 40	Length of palate	. 34

^o The first four measurements taken from the alcoholic specimen.

B—WITH FOUR UPPER PREMOLARS, TEETH 30.

BLARINA CINEREA.

Sorex cinereus, BACH., J. A. N. Sc. Ph. VII, 1837, 373 ; pl. xxiii, f. 3.

??? *Sorex parvus*, SAY, Long's Exped. I, 1823, 163.

SP. CH.—Longest hairs on the back measuring about two lines and a half. Feet small ; hand contained about one and a half times in the foot, which is but little more than half the skull. Tail shorter than the head ; very thin.

Color above, iron-gray, glossed with dark olive-brown ; beneath, light gray. Color of the tail, sharply defined. Head and body about $2\frac{1}{2}$ inches. Tail, .75 of an inch. Hind foot about .42.

(Specimens 320, 94.)—Body rather stout and full ; muzzle moderately long, with the snout bilobed as usual, and the nostrils lateral. Whiskers rather short, and not very numerous, mixed black and white. Ears short, entirely concealed by the fur ; in life the auricle directed forwards and covering the meatus ; no hair on the external face of the ear, except on the extreme edges of the supplementary lobes, formed by antitragus and antihelix. Fur rather short, and not compact, the longest hairs measuring about two and a half lines. Feet very small ; anterior contained one and a half times in the hinder, which can be little more than half the length of the skull, although this is defective in all the specimens before me. The first toe is short, its claws not quite reaching the penultimate articulation of the second.

The tail is very short, not as long as the head, very slender and depressed in the dried skin, well coated with hairs, which project slightly at the tip, but without forming a distinct pencil.

The upper parts are of mixed iron gray and olive brown, the fur being lead color at base, then light iron gray, and finally tipped with olive brown : the combination of these tints gives a hoary appearance, somewhat resembling a pepper and salt. The under parts are of a lighter tint of brownish gray or light ash ; the line of demarcation in one specimen indistinct, in another more evident. The upper half of the tail is like the back ; the lower lighter than the belly ; the two colors sharply defined.

The skulls of the specimens before me are too much broken to exhibit their true shape and proportions. The dental formula is $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$.

The upper anterior incisor is much hooked, with a second hook on the cutting edge, a little anterior to the base, its point coming down to a line with those of the succeeding teeth. There is no internal lobe to these incisors, and the pair approach each other at an angle, without meeting, to near the tips, which are parallel. The first premolar tooth is a little smaller than the second ; the third considerably smaller than either (about half as long as the second). There is a very slight interval between the third lateral tooth and the first molar, and the diminutive

fourth tooth is barely visible from outside. The lower anterior incisors have slight indications of two or three lobed dentations.

Measurements.	No. 320.	No. 94, (stretched?)
	Inches. Lines.	Inches. Lines.
Nose to root of tail	2. 6	2. 7½
Tail to end of vert.	0. 9	. 9
Tail to end of hairs	. 9½	. 10
Hand from wrist	. 3½	. 3½
Foot from heel	. 5	. 4½
Bony palate	. 3½	. 3½
Width of upper jaw .....	.....	. 2¼

The specimens of this species before me from South Carolina agree very well with the descriptions of Dr. Bachman, except as to the number of the teeth, the formula given by him being $\frac{2}{2} + \frac{3-3}{0-0} + \frac{4-4}{4-4} = 26$. This is, however, probably an error, as in a specimen presented by Dr. Bachman to the Academy of Natural Sciences, and labelled by him *S. cinereus*, the formula is as given at the beginning of the article, the sum being 30 teeth instead of 26. The species is not reproduced in the "Quadrupeds of North America," whether omitted by mistake, or considered to be the young of some other, is not stated.

	2155	2156
Nose to eye	. 35	. 34
Nose to ear .....	.....	. 50
Nose to occiput .....	.....	. 75
Nose to root of tail	2. 40	1. 85
Tail to end of vertebrae	. 80	. 70
Tail to end of hairs	. 90	. 76
Fore foot	. 35	. 30
Hind foot	. 46	. 40
Length of skull	. 68	. 65
Width .....	.....	. 32
Length of palate	. 28	. 25
Width of upper jaw	. 22	. 18

The preceding descriptions were taken from dried skins, which afford very unsatisfactory data for the critical definition of species. Number 1670 differs in having the teeth much less deeply colored, and in being of a greenish yellow color beneath; this is, however, owing doubtless to the fact that it had been for a time immersed in alcohol.

A very badly preserved specimen in alcohol from Indian River, Florida, exhibits some differences, especially in the longer tail, and larger size generally, including the skull and feet. For the present, however, I shall refer it to *B. cinerea*.

A very good specimen in alcohol, from Carlisle, Pennsylvania, agrees in the main with the South Carolina specimen, as will be seen by the following description:

Body small and rather slender; head not very acutely pointed. Eyes small, scarcely visible. Ears with the auricle directed forward entirely, the helix not as prominent as the highly developed antitragus and antihelix, which are naked, with a ciliation of hairs on the edges only; the anterior face of the ear naked; the posterior covered with hair.

The feet are rather broad and full; the anterior large in proportion, longer than the distance from heel to end of metatarsus. The fore and hind claws are of nearly the same size. The heel, for about half the length of the metatarsus beneath, is entirely hairy, the hairs reaching to the first pair of tubercles, but not between and beyond them. There are six large tubercles in all, with smaller ones interspersed.

The tail (exclusive of the hairs) is shorter than the head. It is rather thickened and obtuse to the tip; well covered with short hairs and terminated by a pencil.

The upper parts are of a cinereous or dark ash, mixed and tipped with a dark wood-brown, the ash showing through. The lower half of the sides and the under parts, generally, are of a rather light ash-gray. The feet are white; the tail bicolor. The skull has 30 teeth. The anterior upper incisor has a basal pointed lobe about as long, but thicker than the third premolar. The second and first premolars are long, the former largest; they extend almost as far down as the tip of the anterior incisor. There is a slight diastema between the third premolar and the first molar. The fourth premolar is very rudimentary. The lower anterior incisor is long and has two serrated lobes in its upper edge. It extends backwards as far as the second premolar does, and to the first molar.

The teeth of this specimen differ in some respects from the specimens of *Sorex cinereus* from South Carolina; they are much more deeply colored; the upper anterior incisor longer and more curved; its basal lobe more distinct. The two anterior upper premolars are longer, more vertical, and pointed, more canine in appearance. The true molars are narrower. The lower anterior incisors are larger, deeper, more curved, and more lobed; the remaining teeth are larger and higher.

The measurement of this specimen will be found with that from Indian river.

I do not feel sure that the *Sorex cinereus* of Bachman may not be the true *S. parvus* of Say, as I am unable to appreciate the differences between the two, as described by Bachman and Say. Perhaps the specimen from Carlisle is different from more southern ones—may be the true *parvus*. The solution of this question, however, as of many others in reference to the American shrews, must be left until a greater number of specimens of different ages and seasons can be brought together from many localities.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
320	1808	Liberty county, Ga.....	Major John L. Leconte	Skin
1669	-----	do	do	do
1670	-----	do	do	do
94	1771	South Carolina.....	Dr. Bachman	do
2155	3110	Indian river, Fla.....	G. Wurdeman	In alcohol
2156	3103	Carlisle, Penn.....	D. Miller, jr.....	do

BLARINA EXILIPES, Baird.

Sr. CH.—Small. Fur full, longest hairs measuring 2 lines. Feet very small; the anterior not $3\frac{1}{2}$ lines; the posterior 5, or about five-eighths the length of the skull.

Color above, hoary olive-brown, with a chestnut tinge. Beneath, grayish-white. Tail bicolored. Head and body, less than 2 inches. Tail about 0.60 of an inch.

Size very small; body slender. Ear small and concealed in the fur, apparently much as in *S. cinereus*. Fur full, compact, longest hairs measuring about two lines. Feet very small; anterior contained one and a half times in the posterior, which are not five eighths the length of the skull. The hand, however, appears larger. The soles, as far as can be ascertained, are hairy towards the heel, as in *S. cinereus* and other short-tailed species. There is a seventh tubercle behind the posterior hair. The first toe appears unusually short, barely reaching the anti-penultimate articulation. The tail is very short, not as long as the head, thin, and coated with short hairs.

Color.—The upper parts are of an olive chestnut-brown, or, perhaps, a light liver-brown, with a slight purplish tinge and a hoary appearance, caused by the light bar near the tips of the hairs. Beneath, grayish or ashy white, with a tinge of yellowish anteriorly. The tail is bicolor.

The skull is broader anteriorly than in the long-tailed shrews. The dental formula is $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. The anterior upper incisors have a basal conical process, scarcely to be called a hook, which comes down as far as the lateral teeth, and is nearly as large as the first one. There is no internal lobe and the teeth are considerably separated. The first lateral tooth is rather smaller than the second, and the third little more than half as long as the latter; a slight diastema anterior to the first upper molar barely allows the fourth lateral to be seen. The lower anterior incisors have very obsolete dentations on the cutting edge. The crowns and points of all the teeth are well colored, of a dark chestnut; darkest on the tips.

Measurements.

	No. 640.		No. 641.		No. 631.		No. 639.	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to occiput ¹	0	9	0	8	-----	10	-----	9
Nose to root of tail ¹	2	1	1	11	2	3	2	0
Tail to end of vertebræ ¹	-----	8	-----	7	-----	8	-----	9
Tail to end of hairs ¹	-----	$8\frac{1}{2}$	-----	$7\frac{1}{2}$	-----	$8\frac{1}{2}$	-----	10
Hand from wrist	-----	3	-----	3	-----	$3\frac{2}{3}$	-----	$3\frac{5}{3}$
Foot from heel	-----	$4\frac{1}{2}$	-----	$4\frac{5}{3}$	-----	5	-----	$5\frac{1}{3}$
Skull, length	-----	8	-----	$7\frac{2}{3}$	-----	8	-----	8
Skull, breadth	-----	$3\frac{1}{2}$	-----	$3\frac{1}{2}$	-----	$3\frac{1}{2}$	-----	-----
Skull, length of palate	-----	$3\frac{2}{3}$	-----	3	-----	$3\frac{2}{3}$	-----	$3\frac{2}{3}$
Skull, width of upper part	-----	$4\frac{1}{2}$	-----	$2\frac{2}{3}$	-----	$2\frac{1}{2}$	-----	$2\frac{1}{3}$

¹ Measurements taken before skinning.

Measurement of alcoholic specimens.

	2157	2158	2161
Nose to eye.....	.35	.34	.32
Nose to ear.....	.50	.50	.50
Nose to occiput.....	.75	.75	.72
Nose to root of tail.....	1.85	1.80	1.80
Tail to end of vertebræ.....	.56	.61	.50
Tail to end of hairs.....		.65	
Fore foot.....	.26	.26	.26
Hind foot.....	.38	.38	.36

The specimen from Brownsville agrees very well with those described from Mississippi. That from St. Louis differs slightly in a rather longer tail and larger feet; the hair on the back is longer, measuring two and two-third lines. The color of the back is lighter and brighter too, having a faint tinge of chestnut. Still, as the skulls agree perfectly, and the distinctions mentioned are not very tangible, it is probable that the difference may be owing merely to age or season.

The specimen from Spottsylvania county, Virginia, agrees very well with those from Washington, Mississippi. Number 2166 is much more like that from St. Louis, being appreciably larger than the rest; the tail thicker and more hairy; the fur on the back longer, or over .20 of an inch. The color above is a rich wood-brown, beneath an ashy white, in strong contrast. It is quite possible that further investigations and fuller collections will separate the St. Louis and Illinois specimens from the rest, in which event they may bear the name of *B. eximius*.¹

The only species to which, in the proportions of feet, tail, and skull this can be compared, is the *S. cinereus*, and in the absence of more specimens of both forms I cannot feel sure that the Mississippi specimens may not prove to be the young of *S. cinereus*. Dr. Bachman, however, who has seen many specimens of this species, makes no mention of any like the present; and out of four from the same locality in Mississippi all have the same characteristics as distinguished from *S. cinereus*. Thus, the size is much less, and the body more slender. The fur is longer in proportion, and more compact. The feet, though small, are rather larger than in *S. cinereus*. The teeth are more deeply colored, though smaller. The colors, however, are decidedly different, that of the upper parts being an olive chestnut-brown or liver-brown; in *S. cinereus* of an iron-gray. The under parts, too, are of a clearer, purer white.

¹ This Illinois specimen resembles closely Audubon's figure of *Sorex parvus*.

List of specimens.

Catalogue number	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
640	1791	♀	Washington, Miss -----		Col B. L. C. Wailes.	Skin from alcohol.
641	1792	♀	-----do-----		-----do-----	-----do-----
2158			-----do-----		-----do-----	In alcohol.
2157			-----do-----		-----do-----	-----do-----
2161			Spottsylvania co., Va ..	1856	A. W. Massey.	-----do-----
? 631	1782		Brownsville, Tenn.		Capt. S. Van Vliet.	Skin from alcohol.
? 639	1790	♂	St. Louis, Mo.		Dr. George Engelmann.	Skin.
? 2166	3109		DeKalb county, Ill.	1856	R. Kennicott.	-----do-----

BLARINA BERLANDIERI.

SP. CH.—Size small Fur very full and velvet-like; hairs scarcely exceeding one line. Feet moderate; hand less than 3½ lines, foot less than five. Tail considerably shorter than the head.

Color above, hoary chestnut-brown, with a tinge of olivaceous; beneath, yellow brownish-white. Line of separation between color of upper and under surfaces of tail not distinct. Teeth much larger than in other species. Head and body, two inches. Tail less than three-quarters of an inch. Teeth, 30.

Size small; body moderately stout. Fur very full, compact and soft, but short, scarcely exceeding one line; on the thorax and breast it stands almost erect in a short pile. Ears small, inconspicuous, concealed by the fur; the auricle naked on the external face, very rudimentary, compared with antitragus and antihelix. The feet though short are stout and broad; the anterior contained less than one and a half times in the posterior. Soles hairy at the heel. The tail is about equal to the head, or a little shorter; slender, thinly coated with hair, and with a slight pencil at the tip.

The colors of this species cannot be given with any great degree of accuracy, as long immersion of the specimens in alcohol has probably produced some alteration. In one, the prevailing tint is a chestnut brown at the tips of the hairs, with paler next to the tips, producing a slight hoariness. The under parts are a yellowish brownish white; the line of demarcation on the sides quite indistinct. The tail is similarly colored; but the difference in color between the under and upper surfaces is scarcely appreciable. In another specimen the upper parts are darker, with a tinge of purplish; the under parts more yellowish.

The cranium is wanting in the specimens examined. The dental formula is $\frac{2}{2} + \frac{4-4}{2-2} + \frac{4-4}{3-3} = 30$. The teeth are all unusually large in proportion to the size of the skull and of the animal. The anterior upper incisor has a conical process at base—not a hook—the point of which does not come down to the level of the next two teeth. The first of these teeth is rather shorter than the second; both are unusually long, pointed, and perpendicular, quite canine in appearance; not so oblique as in other species. The third tooth is not half as long as the second, and is placed close to the first molar; the molars are very large. The fourth lateral tooth is very small, and not visible from outside. The lower anterior incisor has two serrated lobes on the cutting edge. All the teeth are well colored on the crowns; darkest on the points.

Measurements.

	No. 642.		No. 643.	
	Inches.	Lines.	Inches.	Lines.
Head to occiput ¹	0	8	0	9
Head to root of tail ¹	2	0	2	0
Tail to end of vertebræ ¹		9		7
Tail to end of hairs ¹		9½		7½
Hand from wrist		3½		3½
Foot from heel		4½		4½
Skull, length of palate		3½		3½
Skull, width of palate		2½		2½

Measurements of two specimens in alcohol.

	2159.	2160.
Nose to eye	.36	.30
Ear	.58	.52
Occiput	.78	.75
Root of tail	2.00	1.92
Tail to end of vertebræ	.60	.55
Tail to end of hairs	.65	.62
Hand	.27	.27
Foot	.40	.39

The only species requiring comparison with this is the *S. exilipes*, a specimen of which, doubtfully referred to this species, has been found at Brownsville, on the opposite bank of the Rio Grande. It may, however, be readily distinguished by the character of the fur, which is very short and close, sub-erect, almost like long-piled velvet, especially on the breast and throat, instead of lying back. The feet are larger and broader. The most appreciable difference, however, is in the teeth, which are much larger in every way; the first two lateral upper teeth are much longer and more pointed, and instead of sloping forward and overlapping they are almost directed backwards, or at least perpendicularly to the palate. The colors, too, are appreciably different.

The specimens described form part of the Berlandier collection presented to the Smithsonian Institution by Lieutenant Couch, and were probably gathered by Dr. Berlandier, in the vicinity of Matamoras. Among the notes of Dr. Berlandier is the description of a *Sorex*, for which he proposes the name of *S. lessonii*, and which may possibly refer to one of the above specimens, although there is some discrepancy. There is unfortunately no description of the teeth of his animal.

¹ Measurements taken before skinning.

The Rio Grande of Texas is probably the northern limit of this species, while its southern is yet unknown. No North American shrew has heretofore been recorded from so southern a locality.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex & age.	Locality.	Whence obtained.	Nature of specimen.
2159	-----	-----	Matamoras, Mexico -----	Lieut. D N. Couch -----	In alcohol.-----
2160	-----	-----	-----do-----	-----do-----	-----do-----
642	1793	♂	-----do-----	-----do-----	Skin from alcohol.-----
643	1794	♂	-----do-----	-----do-----	-----do-----

The following species of North American shrews I have not yet been able to examine :

1. SOREX PALUSTRIS.

Sorex palustris, RICH. Zool. Jour. III, Jan.-Ap. 1828, 516.

RICH. F. B. A. I. 1829, 5.

AUD. A BACH. N. A. Quad. III, 1853, 108, pl. cxxv. (Description and figures from Richardson's specimen.)

Amphisorex palustris, GRAY, Pr. Zool. Soc. Lond. V, 1837, 125.

Crossopus palustris, WAGNER, Suppl. Schreber, V, 1855, 542.

This strongly marked species is an inhabitant of the Hudson's Bay region, and has not yet been detected within the limits of the United States. It is the largest of our true shrews of the restricted genus *Sorex*, measuring $3\frac{1}{2}$ inches to root of tail ; tail, $2\frac{7}{12}$. The back is hoary black ; the belly ash gray.

2. SOREX FIMBRIPES.

Sorex fimbripes, BACHMAN, J. A. N. Sc. Ph. VII, 1837, 391 ; pl. xxiv, f. 8.

AUD. & BACH., N. A. Quad. III, 1854, 312. (From preceding)

A single specimen of this species was taken by Professor Walter R. Johnson, on Drury's Run, Lycoming county, Pennsylvania, and by him presented to the Philadelphia Academy of Natural Sciences, where it was described by Dr. Bachman. It measured $2\frac{1}{8}$ inches to the root of the tail ; the tail, $1\frac{3}{4}$. Above, it is of a brown color ; beneath, buff. The fur is unusually long. The most striking peculiarity, however, is in the very broad fore feet and the fringe of stiff hairs bordering them. The hands are said to resemble those of a turtle, and in truth, according to the description, they are broader (0.19 of an inch) than in large specimens of *Blarina talpoides*. In some respects this species would seem to approach *Sorex pachyurus*, described above, although this has by no means such extreme peculiarities of feet.

In the long muzzle, broad fore feet, and full fur, there is an approximation to the genus *Urotrichus*, of much interest.

3. SOREX PARVUS.

Sorex parvus, SAY, Long. Exped. I, 1823, 164.

HARLAN, F. A. 1825, 29.

BACHMAN, J. A. N. Sc. Ph. VII, 1837, 394. (Copied.)

? AUD. & BACH., N. A. Quad. II, 1851, 145; pl. lxx.

The *Sorex parvus* of Say is yet an unidentified species, though it comes very close to the *S. cinereus* of Bachman, and may possibly one day supplant this name. The animal referred to by Aud. and Bachman differs in some points from Say's description, and will probably prove to be different. The indication of 32 teeth, if correct, would confirm this impression, as Say's animal, in all probability, had but 30. The specimen from Carlisle, Pennsylvania, described under the head of *Blarina cinerea*, may be the same with that of Aud. and Bach., while that from Illinois (2166.53) comes still nearer to it.

In any event, the *Sorex parvus* of Say will be found to belong to the genus *Blarina*, and to have probably 30 teeth.

4. SOREX HARLANI.

Sorex (Brachysorex) harlani, DUVERNOY, Mag. de Zool. 1842, 40; pl. liii, 6.

Sorex harlani, WAGNER, Suppl. Schreb. V, 1855, 550.

This diminutive species of *Blarina* was collected at New Harmony, Indiana, by Lesueur, and described by Duvernoy. It belongs to the section with 30 teeth, and measures about $2\frac{1}{4}$ inches, with a tail of 0.55 or 0.60 hundredths. It is of a brownish-gray above and on the sides, and a purer gray beneath. The distinctive characters from *Sorex parvus* of Say, and *S. cinereus* of Bachman, are by no means apparent.

Of the preceding species, the two first are unquestionably distinct and different from any here described. The last two may possibly belong to species already referred to.

FAMILY.

TALPIDAE.

External ear wanting ; no neck ; fore feet greatly expanded, with strong fossorial claws ; limbs very short.

The family of *Talpidae*, or moles, embraces several genera, which, though presenting sufficient differences among each other, yet agree in having a stout, thick, clumsy body, without visible neck ; no external ears ; the meatus auditorius sometimes very minute, sometimes as large as usual ; the eye very small, sometimes concealed by the integument. The nostrils are sometimes at the end of the snout, sometimes lateral or superior ; in one genus surrounded by a fringe of radiating processes. The limbs are short ; the anterior much broader and larger than the hinder, with strong claws. The tail is usually short ; sometimes almost as long as the body. The fur is generally soft, compact, and like velvet in texture.

The moles are distributed throughout the world, except in the intertropical portions, and in South America. The genera are, however, closely restricted, each region having its characteristic one. Thus *Talpa* is only found in Europe and Asia ; *Scalops* and *Condylura*, in North America ; *Chrysochloris* in Africa, and *Urotrichus* in Japan and Northwest America. There are also several extinct genera of *Talpidae*, as *Dimylus*, *Geotrypus*, *Hyporyssus*, *Palaeospalax*, and *Spalacotherium*.

The moles are found in nearly every portion of North America as far to the south as Mexico. *Condylura* inhabit the northern parts of the United States, from the Atlantic to the Pacific. One species of *Scalops* (perhaps two) is restricted to the Pacific coast, one to the Atlantic ; one is found sparingly in Massachusetts, New York, and Ohio ; and another on the prairies of Michigan, Illinois, and the West. One genus, *Urotrichus*, has hitherto only been found in the Cascade mountains of Washington Territory, and occurring also in Japan, is the only one common to America and any other part of the world.

Notwithstanding the assertions of some authors, we have no evidence of the existence of the genus *Talpa* in America, nor indeed of *Scalops* in Europe.

SCALOPS, Cuvier.

Scalops, Cuv. "Leçons d'Anat. Comp. I, 1800."

GEN. CH.—Nose elongated, not fringed; nostrils superior or lateral; eyes hidden; tail short; teeth 36 or 44, the two anterior upper ones unusually large, and somewhat like those of a rodent.

Feet with the palms very broad; the claws broad, depressed, and long, five in number. Hind feet much narrower than the anterior, though generally of nearly the same length; the claws subconical, long, and sharp pointed. The toes more or less webbed to the claws. Tail short, naked or hairy. Eyes very small; sometimes covered by the integument. Ears varying from a pin-hole to 0.10 of an inch in diameter. Snout long, depressed, conical, cartilaginous, without any fringe at the extremity; the nostrils opening at the end of the muzzle, either laterally or superiorly.

The teeth vary from 36 to 44, according to the species. The two middle incisor teeth (one on each side) in the upper jaw are very large and broad; the two next succeeding, on either side, are small; the next, representing the canine, is a little larger. The premolars vary with the species, from three to four; the lower incisors from two to three, making the difference in the whole number of 8, ($\frac{1-1}{3-3}$). The premolars increase progressively from the canine to the molars. In the lower jaw, the first incisor is very small; the second is a good deal larger, especially in *S. aquaticus*; the remaining teeth increase progressively in size to the molars.

The characters of *Scalops*, as given above, embrace two very distinct types of dentition; the differences being not only in the number but also in the character of the teeth themselves. Pomel, in a sketch of the geographical distribution of the *Insectivora*, published in the Bulletin de la Soc. Geologique de France, for 1842, while very properly retaining the name of *Scalops* for the species with 36 teeth, indicates, without describing, a genus, *Scapanus*, for those with 44. The distinguishing characters will then be as follows:

Scalops.—Teeth 36. Formula: incisors $\frac{3-3}{2-2}$, canines $\frac{1-1}{1-1}$, premolars $\frac{3-3}{2-2}$, molars $\frac{3-3}{3-3} = 20$; or perhaps more correctly—incisors $\frac{3-3}{2-2}$, canines $\frac{1-1}{0-0}$, premolars $\frac{3-3}{3-3}$, molars $\frac{3-3}{3-3} = \frac{20}{16} = 36$ teeth. The two lateral incisors on each side above very small, thread-like, and often deciduous; the canine large, and fitting into a diastema between the second and third teeth of the lower jaw; the two anterior molars nearly quadrate, without any small basal cusp visible on the anterior outline, either externally or internally, (indicated very faintly in the first upper molar.) All the lateral teeth separated by diastemata; the canine wanting. The second external lower incisor much larger than the first; canine-like. Tail nearly naked. Nostrils in the obliquely truncated end of the muzzle, but antero-superior; not visible from beneath.

Scapanus.—Teeth 44. Formula: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{3-3}{3-3} = \frac{22}{22} = 44$. All the teeth of both jaws anterior to the last premolar, (excepting the broad anterior upper incisor,) are of nearly equal size, conical, the upper ones with the points rounded off, and closely resembling the simple teeth of Cetaceans; the lower more compressed and with the points more acute. The upper canine is only appreciably larger than the two incisors anterior to it, and the two premolars immediately succeeding. The premolars increase in diameter from first to third, though of equal length; the fourth is much larger, and triangular in section. The

penultimate upper molar is trapezoidal, nearly triangular in cross section, instead of subquadrate; the one anterior to it is also trapezoidal, instead of lozenge shaped. Viewed externally, there is a small acute lobe on the anterior edge of the last premolar, and all the molars, close to the base of the crown; and there is a similar lobe on the inner edge of the corresponding teeth of the lower jaw. The molars are in close contact; the teeth anterior to these, in the upper jaw, are separated by diastemata. The lower incisors are of nearly equal size, the second not larger than the first. The nostrils are near the end of the muzzle, either lateral or superior. The tail is more or less hairy.

The chief differences in dentition between *Scalops* and *Scapanus*, then, are in the greater number of teeth in the latter; the greater permanence and more uniform size of the incisors and premolars; the anterior basal fang to the last premolar and the molars, and the different shape of the molars. Other distinctions might be enumerated, but at the risk of pursuing the subject into too great detail for my present purpose.

To the restricted genus *Scalops* belong at present three species: *S. aquaticus*, inhabiting the whole eastern portion of the United States, from Massachusetts to Florida, and west to Mississippi and Alabama; *S. argentatus*, a prairie species, ranging from Michigan, through northern Ohio, Illinois, Missouri, northern Louisiana, Arkansas, Kansas, and Nebraska, as far at least as the Upper Missouri; and *S. latimanus*, found in Mexico, and stated also to occur in Texas. No specimens of the latter have come under my notice.

Of *Scapanus* there are two very distinct species, one found in Massachusetts, New York, and northern Ohio, (*S. breweri*,) the other, (*S. townsendii*,) in Washington and Oregon Territories. Whether the California mole, called *Scalops californicus* by Ayres, be really distinct from *S. townsendii* can only be shown by additional specimens; if the same, the range of *S. townsendii* will extend from Puget Sound to San Francisco.

The European analogue to the American mole, though so similar in mere external form, yet differs by so many striking peculiarities of dentition as to render it a matter of very great surprise that authors at this late day should have thrown both into the same genus. To illustrate the differences, I subjoin the chief characters of *Talpa*.

Talpa.—Teeth 44 in number. Formula: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{3-3}{3-3}$ = $\frac{22}{22}$ = 44. The three incisors on each side of the upper jaw are very small and uniform in size, (except in *T. coeca*, where the middle ones are rather largest,) then succeeds a well developed canine, curved, compressed, and trenchant, implanted by two roots, followed by three compressed premolars of similar size and shape, with two fangs each; then a fourth premolar, trihedral with three (?) roots. All the premolars of the lower jaw have double roots, the anterior largest, simulating a canine; the canine itself separated from the premolar by a diastema, and not distinguishable from the incisors in shape.

The nostrils are strictly terminal, and open antero-inferiorly, so as to be visible from below and not from above, the reverse of what is the case in the American moles.

It will thus be seen that *Talpa* differs from *Scalops* in the small size of the anterior upper incisors, the large upper canine, and the double roots to all the premolars, except the last, which has three. In *Scalops* the premolars, except perhaps the last, have simple roots only. In *Talpa* the nostrils are terminal, and antero-inferior. *Condylura* agrees with *Talpa* in the double roots to the premolars.

SCALOPO AQUATICUS.

Common Mole.

Scalops aquaticus, LIN. Syst. Nat. ed. 10th, I, 1758, 53.—In. ed. 12th, 1766, 74.

ERXLEBEN, Syst. Reg. Anim. 1777, 123.

SCHREBER, Säugt. III, 566, tab. clvi. i.

BODDART, Elenchus Anim. 1784, 124.

GMELIN, Syst. Nat. I, 1788, 112.

Scalops aquaticus, FISCHER, Syn. 1829, 249.

BACHMAN, Bost. Jour. N. H. IV, 1843, 28.

WAGNER, Suppl. Schreb. II, 1841, 103.—In. V, 1855, 572.—In. Wiegmann's Archiv, 1843, II, 32.

DEKAY, N. Y. Zool. I, 1842, 15; pl. iv, f. 2.

AUD. & BACH. N. A. Quad. I, 1849, 81; pl. xxxi.

GIEBEL, Säugt. 1855, 895.

Talpa flavescens, ERXLEBEN, Syst. Reg. Anim. 1777, 118. (From Pennant.)

Talpa fusca, SHAW, Gen. Zool. Mamm. I, 1800, 524. (From Pennant.)

Talpa purpurascens, SHAW, Gen. Zool. Mamm. I, 1800, 521. (From Seba.)

Scalops canadensis, DESMAREST, Mam. I, 1820, 155.

HARLAN, F. Am. 1825, 32.

GRIFF, Cuv. V, 1827, 107.

WOODRUFF, Am. Jour. Sc. XXVIII, 1835, 168. (Habits.)

? *Scalops pennsylvanica*, HARLAN, F. Am. 1825, 33.

FISCHER, Syn. 1829, 250.

Brown mole, PENN. Syn. Quad. 1771, 314.—In. 2d ed. 1781, 486.—In. Arctic Zool. I, 1784, 141.

Yellow mole, PENN. Syn. Quad. 1771, 312. (Faded specimen.)

SP. CH.—Teeth 36. Eyes and ears excessively minute; the former not covered by integument. Nostrils antero-superior. Palms broader than long, claws included. Tail nearly naked; feet fully webbed. Color dark plumbeous, with occasionally a brownish tinge; feet and tail white.

This mole is thick and clumsy in its proportions. The muzzle is long and much depressed, the anterior face of the incisors falling about midway between the angle of the mouth and the end of the nose. The upper surface of the snout is naked, the lower portion and the sides are provided with scattered hairs; its under surface has a broad furrow, extending from the incisors to the bulb of the nose.

The nostrils are situated in the end of the snout, which is truncated at an angle of about 45°, or less, to receive them; they are thus antero-superior, not at all visible from below, much more so from above than laterally.

The eye and ear are both exceedingly small, the meatus auditorius not larger than a medium sized dressing-pin hole, the eye about half as large. The orbit is open, as in *S. townsendii*. There is no external ear, and the meatus is almost closed. The eye is a little behind a point midway between the ear and the tip of the nose; it is situated very little behind the angle of the mouth. The ear is placed above the insertion of the arm.

The palms are very large and broad, broader than long, even including the claws. On the inner side, the palm projects in an obtuse angle, some distance beyond the first claw. The claws are very strong and large; the third largest, the fifth smallest.

The hind feet are short and broad, shorter than the fore feet by half the longest fore claw; its claws moderately long and slender; the foot is webbed to the claws, although when the toes are stretched apart the membrane does not go continuously across, but is emarginated between the claws.

The tail is very short and slender, about as long as the fore foot, and rather more than half the length of the head; it is slightly constricted at the base, tapers gently to a moderately obtuse tip, and is scantily coated with white hairs, which are invisible, except on close examination, and allow the tail to appear naked. The upper surfaces of the feet are similarly constituted, and all appear white in the fresh specimen. On the basal third or fourth of the tail, the hairs are larger and darker, and more distinctly noticeable.

The color of this species varies considerably. It is sometimes of a rather light and lustrous pure plumbago, paler below, and without any appreciable mixture of reddish brown. Usually, however, the hairs have a gloss of the latter color, particularly such as have been preserved for a time in alcohol. The precise shade of coloration varies almost with the specimen. I have never seen any as dark as *S. townsendii*, from Oregon, though several resembles closely in color the *S. californicus* of Ayres.

A single specimen in the entire series before me (No. 2465, from St. Simon's island, Georgia) has a large transverse blotch or patch on the abdomen, in which the hairs are yellowish white to the roots. This corresponds to a similar variety of *Scalops townsendii*, figured by Audubon and Bachman, and described as a distinct species (*S. taniata*) by Leconte.

Measurements.

Current number.	Locality.	From nose to the—				Tail to the end of—		Hand.	Foot.	Width of palm.	Nature of specimen.
		Eye.	Ear.	Back of head.	Root of tail.	Vert.	Hair.				
2215	Blount county, Tenn.	-----	-----	-----	5. 00	-----	-----	. 88	. 80	. 90	In alcohol.
2203	Jackson county, N. C.	. 65	1. 15	1. 55	4. 35	. 85	1. 00	-----	-----	. 75	-----do-----
2195	Indian River, Fla.	. 60	1. 25	1. 30	3. 95	. 92	-----	-----	-----	. 76	-----do-----
2207	Do.	. 62	1. 20	1. 58	4. 04	. 82	-----	. 73	-----	. 73	-----do-----
2204	Jacksonville, Fla.	. 60	1. 15	1. 50	3. 54	. 88	-----	-----	-----	. 75	-----do-----
2216	Eutaw, Ala.	-----	1. 15	1. 65	4. 20	1. 12	-----	. 82	. 65	. 80	-----do-----
2192	Society Hill, S. C.	. 79	1. 11	1. 82	4. 15	. 87	-----	-----	-----	. 60	-----do-----
2172	Spottsylvania county, Va.	. 82	-----	1. 63	4. 45	. 80	-----	-----	-----	. 63	-----do-----
2174	Do.	-----	-----	1. 60	4. 65	. 90	1. 02	-----	-----	. 75	-----do-----
2175	Do.	. 70	-----	1. 63	4. 46	1. 05	1. 11	-----	-----	. 66	-----do-----
2191	Carlisle, Penn.	. 69	-----	1. 52	4. 10	1. 05	-----	-----	-----	. 68	-----do-----
2190	Upper Darby, Penn.	-----	-----	1. 80	4. 85	. 95	-----	-----	-----	. 73	-----do-----
2193	Washington, D. C.	-----	-----	1. 75	4. 55	. 95	-----	-----	-----	. 75	-----do-----
2213	Wethersfield, Conn.	-----	1. 00	1. 68	4. 42	1. 19	-----	. 86	. 73	. 90	-----do-----
2212	Washington, Miss.	-----	-----	1. 75	4. 38	. 85	1. 00	-----	-----	. 77	-----do-----

The general range of this species is well indicated by the list of the specimens examined. I am not sure that the one last mentioned, from Blount county, Tennessee, is not the *S. argen-tatus*. Considerable differences exist in different specimens as to the breadth of the palm and other characteristics; those from the southern States appearing to have them less fully developed. I have, however, not been able to detect any positive characters by which they might be distinguished.

The *Scalops aquaticus* differs in several important respects from the species with 44 molars, in addition to its having but 36 teeth and other peculiarities. The muzzle is rather broader and more obtuse than in *S. townsendii*, although the position and character of the nostrils are similar. The eye is more anterior, and the ear is much smaller. The palms are much broader in proportion; in fact, with the claws, the dimensions of length and breadth in *S. aquaticus* are about as they are without them in *S. townsendii*. The latter species lacks the projecting angle of the inner side of the palm, and the hand is more deeply split between the fingers. The hind foot is shorter and broader at the toes; the web extends much further along to the claws. The tail is shorter and more thinly clothed with hair.

Compared with *S. breweri*, the lateral nostrils, the very thick and densely black-haired tail of the latter, constitute striking features of distinction. The eye of *S. breweri*, also, while similarly situated, is covered by an extension of skin, through which the ball is visible, instead of being concealed. The meatus, too, is much larger than in *S. aquaticus*; the palms are much smaller and narrower in proportion; while smaller than in *S. townsendii*, their shape and amount of webbing are much as in the last mentioned species, strikingly different from *S. aquaticus*.

The species is much more closely allied to *S. argentatus*, the article on which I refer to, for the distinctive peculiarities.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	When collected.	Whence obtained.	Nature of specimen.
870	-----	Middleboro, Mass.	July 22, 1855	J. W. Jenks	Dry skin ..
1374	-----	Raynor Beach, N. J.	May 22, 1832	W. Cooper	do
2213	-----	Wethersfield, Conn.	-----	C. Wright	Alcohol ...
51	956	Carlisle, Penn.	-----	S. F. Baird	Skin
2193	-----	Washington, D. C.	-----	-----	Alcohol ...
158	1140	Clark county, Va.	-----	Dr. Kennerly	Skin.
2172	-----	Spottsylvania county, Va.	-----	A. W. Massey	Alcohol ...
2203	-----	Jackson, N. C.	-----	Rev. F. Fitzgerald	do
2192	-----	Society Hill, N. C.	-----	Rev. M. A. Curtis	do
831	-----	Abbeville, S. C.	-----	Dr. Barratt	Skin.
-----	967	Columbus, Ga.	-----	Dr. Gesner	In alcohol.
49	-----	Savannah, Ga.	-----	R. R. Cuyler	Skin.
1624	-----	St. Simon's Island, Ga.	-----	Dr. Wilson	do
2465	-----	do	-----	do	In alcohol.
2195	-----	Indian River, Fla.	-----	G. Wurdemann	Alcohol ...
2204	-----	Jacksonville, Fla.	-----	Dr. A. J. Baldwin	do
2215	-----	Eutaw, Ala.	-----	Prof. A. Winchell	do
33	944	Kemper county, Miss.	-----	D. C. Lloyd	Skin.
160	1142	Washington, Miss.	-----	Col. Wailes	do
2215	-----	Blount county, Tenn.	-----	Prof. Mitchell	-----

SCALOPS ARGENTATUS.

Silver or Prairie Mole.

Scalops argentatus, AUD. & BACH. Jour. Acad. Nat. Sc. Phila. VIII, II, 1842, 292.—IB. N. A. Quad. III, 1853, 252; pl. cl, f. 4.

WAGNER, in Wiegman. Archiv, 1843, II, 31.—IB. Suppl. Schreb. V, 1855, 573.

SP. CH.—Larger than *S. aquaticus*. Teeth 36. Eyes and ears very minute, the former covered by the integument. Nostrils antero-superior. Palms scarcely broader than long; tail nearly naked. Color silvery plumbeous.

This species is very similar to the *S. aquaticus*, and smaller specimens are with difficulty distinguishable from the latter; indeed, it may be a question whether the two can with entire propriety be separated. The combination of the larger size, more silvery color, and more western locality, may, however, substantiate the claim of *S. argentatus* to a separate place.

The muzzle is elongated and depressed, the nostrils opening on its antero-superior truncation, much as in *S. aquaticus*, but rather more superior. The anterior face of the upper incisor is a little anterior to a point midway between the eye and the tip of the nose. The eye is visible as a small bluish speck through the integument, which is not pierced even by a pin-hole aperture, as in *S. aquaticus*. It is placed a little behind the posterior angle of the jaws. The ear is represented only by a circular meatus, about the twenty-fifth of an inch in diameter.

The palms are very large, with the claws but little longer than broad. The hind feet are about as long as the anterior ones, but much narrower. The amount of webbing to the feet is much as in *S. aquaticus*.

The general color of this species is a light silvery plumbeous brown, not very dissimilar to that of freshly cut lead. The under parts are a little lighter, especially just back of the arms; a more brownish tint is usually imparted by immersion in alcohol. The prevailing color of the feet and tail is white, the latter rather more densely hairy than in the *aquaticus*, as well as longer.

The *Scalops argentatus* is sufficiently distinct in its characters to require comparisons only with *S. aquaticus*. The size is much larger, the general proportions similar. The nostrils are more superior; the head more slender; the eye is entirely covered by the integument, which extends over the ball, instead of being pierced by an orbital opening. The ear is a little larger. The color is much more silvery in its lustre, without any brown.

The difference in the size of those species is very appreciable in the skulls, of which I subjoin the comparative dimensions of the largest specimens in the collection of each.

The skull exhibits the dentition of *S. aquaticus* in having 36 teeth; or, according to the determination of Owen, incisors $\frac{3-3}{2-2}$, canines $\frac{1-1}{0-0}$, premolars $\frac{3-3}{3-3}$, molars $\frac{3-3}{3-3}$. In the upper jaw the anterior incisor is very large and rodent-like; the two lateral on either side are very small and thread-like, and quite deciduous. The canine is moderately thick and prismatic; the three premolars are similarly shaped, and increase successively from first to third; the anterior smaller, the middle larger than the canine. All the teeth in the jaws are separated by diastemata.

By the decadence of the small lateral incisors, the number of teeth may be reduced to 34 or 32. The anterior lower incisor is also very small, and sometimes wanting, making the teeth 30 in number.

	S. argentatus.		S. aquaticus.	
	1838. 503.	2016. 1029.	958.	1935. 754.
Length of skull	1.54	-----	1.40	1.30
Greatest width	.80	.75	.70	.67
Least interorbital space	.33	.32	.30	.31
Width of nose	.20	.20	.15	.16
Length of palate	.72	.69	.67	.60
Width outside the molars	.45	.42	.38	.39

° From St. Louis.

Measurements.

Current number.	Locality.	Nose to—		Tail to end of—		Length of—		Breadth of palm.	Nature of specimen.
		Occip	Root of tail.	Verteb.	Hairs.	Hand.	Foot.		
1922	West of Fort Riley	1.75	6.25	1.00	1.12	-----	-----	.78	From alcohol
2236	Alton, Ill.	1.80	-----	-----	-----	.88	.85	.94	Specimen
2196	St. Louis, Mo	1.90	4.98	1.12	-----	-----	-----	.90	do
2197	do	1.93	5.15	1.15	-----	-----	-----	.80	do
2199	do	1.80	4.67	-----	-----	-----	-----	.71	do
2200	do	1.74	5.10	-----	-----	-----	-----	.70	do
2176	Fort Smith, Ark	1.73	4.74	-----	-----	-----	-----	.70	do
2186	Prairie Mer Rouge, La	1.82	4.63	-----	-----	-----	-----	.82	do
2214	Columbus, Ohio	1.89	4.38	1.12	1.29	.90	.85	.83	do

This species was first described from a specimen collected in Michigan by Dr. Geo. Leib. It is essentially a prairie species, where it replaces the *S. aquaticus* of the east. Its extreme range to the west has not yet been ascertained.

List of specimens.

Catalogue number.	Corresponding No. of skull.	No. of specim's.	Locality.	Whence obtained.	Nature of specimen.
773-5	2016	-----	Tremont, Ill.	W. J. Shaw	Dry skin
1029		-----	Alton, Ill.	R Kennicott	Alcohol
? 2214		-----	Columbus, Ohio	L. Lesquereaux	do
-----	-----	14	St. Louis, Mo	Dr. Engelmann	Dry and in alcohol.
-----	-----	13	Prairie Mer Rouge, La	J. Fairie	Alcohol
2176	-----	-----	Fort Smith, Ark	Lieut. Whipple	do
1760	-----	-----	Mouth of Big Sioux, Nebraska	Lieut. G. K. Warren and Dr. F. V. Hayden.	Skin
1922	-----	-----	20 miles west of Fort Riley, Kan.	Lieut. F. T. Bryan and W. S. Wood.	Alcohol

SCALOPS LATIMANUS.

Scalops latimanus, BACH. Pr. Bost. Soc. N. H. Oct. 1841, 41.—IB. Bost. Jour. N. H. IV, 1843, 34.

AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 295.—IB. N. A. Quad. IV, 1854, 323.

WAGNER, in Wieg. Archiv, 1843, II, 32.—IB. Suppl. Schreber Säugt. V, 1855, 573.

The *Scalops latimanus* of Bachman has not yet come under my notice. The diagnosis given is as follows:

“Larger than the common shrew mole, intermediate in size between *S. townsendii* and *S. breweri*. Hair longer and thinner than on either of the other species, and slightly curled. Palms larger than in any other known species. Tail naked, and color nearly black. Inhabits Mexico and Texas.

“Length to root of tail, $7\frac{7}{12}$ inches; of tail, $\frac{10}{12}$; breadth of palm, $\frac{10}{12}$; of tarsus, $\frac{7}{12}$.

“Specimen from Mexico in the Berlin Museum. Another seen from Northern Texas.”

The dimensions of this species do not exceed those of *S. argentatus*; while the palm is not broader (nor so broad) than in specimens of all the other species of American *Scalops*, (except *S. breweri*), as shown above. The combination of the black color, large size, and locality would seem to indicate it to be a genuine species. The description mentions nothing as to the number of teeth or the position of the nostrils.

SCALOPS (SCAPANUS) TOWNSENDII.

Oregon Mole.

Scalops townsendii, BACH. J. A. N. S. Ph. VIII, 1839, 58.—IB. in Townsend's Narr. 1839, 314.—IB. in Pr. Bost. Soc. N. H. I, 1841, 41.—IB. in Jour. Bost. Soc. N. H. IV, 1843, 31.

WAGNER, in Wiegmann's Archiv, 1843, II, 31.—IB. Suppl. Schreber's Säugt. V, 1855, 574.

AUD. & BACH. N. A. Quad. III, 1853, 217; pl. cxlv.

Scalops canadensis, RICH. F. B. A. I, 1829, 9.

Scalops aeneus, CASSIN, Pr. A. N. Sc. Ph. VI, Feb. 1853, 299.

WAGNER, Suppl. Schreb. V, 1855, 574.

AUD. & BACH. N. A. Quad. III, 1854, 321, (from Cassin.)

Scalops taeniata, LECONTE, Pr. A. N. Sc. Ph. VI, June, 1853, 327.

? *Scalops californicus*, AYRES, Pr. Cal. Acad. Nat. Sc. I, May 21, 1855, 54.

SP. CH.—Teeth 44. Eye small, but not covered by the integument. Tail rather scantily haired. Nostrils opening on the upper surface of the tip of the snout. Palm large and broad. Color nearly black, with faint purplish or sooty brown reflection. (Sometimes, perhaps, glossed with silvery?)

Description of a dried skin, No. 361.—Snout elongated, compressed; the nostrils opening on its upper side, near the end. Muzzle nearly naked above, with short hairs; entirely hairy below. Tail moderately long, covered with scanty hairs which do not conceal the skin. Palms large and broad; nearly naked above, with scattered hairs. The toes of the hind feet are cleft to the penultimate articulation.

The general color is a dark purplish, almost sooty black, nearly uniform everywhere. The largest specimen, from Puget Sound, is rather lighter, especially on the lower surfaces.

Measurements. (Taken from dry skins.)

	361.		621.	
	Inches.	Lines.	Inches.	Lines.
Nose to root of tail.....	6	1	5	-----
Tail from root to end of vertebræ.....	1	4	1	3
Naked portion of tail.....	1	1	1	1
Arm, forefoot to end of claws.....		10½	-----	9
Longest claw of arm.....		4½	-----	3½
Leg, hindfoot from heel to end of claws.....		11½	-----	9
Longest claw of leg.....		2	-----	1¾
Length of palm.....		7½	-----	5¾
Breadth of palm.....		6½	-----	6
Length of skull.....	1	7½	1	3

Description of a specimen, No. 2212, in alcohol.—General form that of *S. aquaticus*, but larger. Muzzle long, depressed, truncate at tip; naked for most of that portion anterior to the incisors, or with scattered hairs. The nostrils open antero-superiorly, on a plane oblique to the axis of the muzzle of about 45°; they are, however, partly visible from the side; much more distinctly so from above and the end. There is a smooth bulb or gland at the end; the rest of this muzzle, however, is corrugated; the wrinkles on the lower surface are oblique to the median furrow, and those on either side are parallel to each other.

The eye, though very minute, is not covered by an extension of the skin of the body, as in *S. breweri*, but is open to the air; the orbit, however, is not larger than a pin-hole. It is situated so far back that the posterior angle of the mouth falls about midway between the eye and the upper anterior incisor.

The meatus of the ear is very small and circular, about one-twentieth of an inch in diameter; there is no external ear. The centre of the meatus is about midway between the eye and the occiput.

The palms are very large, and broader than long, exclusive of the claws. These are very large and fossorial; the upper surfaces of the feet are very thinly covered with hair; beneath they are entirely naked. The tail is about as long as the skull; it tapers gently to a rather acute tip, and is scantily beset with rather long hairs, which scarcely take off the appearance of nakedness.

The nostrils of this species are more superior than in *S. breweri*, the palms are proportionally larger and broader. The tail is more acute, and less clothed with hair. The posterior outline of the palm is much less acute, being almost straight, and rounded off at the corners, resembling the longer outline of an ellipse rather than the shorter, as in *S. breweri*. The nostrils of *S. aquaticus* are quite similar in their position to those of *S. townsendii*.

In specimens from Petaluma, in excellent preservation, the muzzle is much broader and more abruptly truncate, although the nostrils are as described. The nostrils are crescentic; the concavity superior; their anterior extremities approach each other very closely; they appear rather more terminal than in northern specimens. The size is less; the palms appear propor-

tionally broader; the tail longer and thicker, tapering less to the tip. The color is a good deal more silvery, almost like *S. aquaticus* or *argentatus*; lighter below, and far from having the sooty brown tinge of *S. townsendii*. The skull is perhaps a little broader; the premolars more compressed and trenchant. The anterior incisors are broad and rodent-like; the two outer ones on either side are entirely lateral, very small and nearly equal; the canine is of similar size, but a little larger. The tooth behind the canine is similar to that anterior to it, but a little shorter; the next two are successively larger and more compressed. In the lower jaw the teeth anterior to the posterior four are simple, subcylindrical, and nearly equal in size.

Notwithstanding these differences, I am by no means sure that the specimens from California are distinct. I have before me five specimens, two from San Francisco, the others from Petaluma. These were all kept some time in alcohol; and the feet, tail, and muzzle are fuller than in dried skins. They are not as large as two specimens of *S. townsendii* from Washington Territory, but are about equal to three others. The skulls do not appear to be perfectly adult.

Should further comparisons show the California mole to be distinct from the Oregon one, the diagnosis will probably be:

Scalops californicus.—Size less than in *S. townsendii*; palms, tail, and muzzle thicker; nostrils more terminal. Color, light sooty brown, glossed with silvery; lighter and clearer beneath. Tail rather hairy; the hairs rather long.

Dr. Ayres speaks of the California mole as differing from *S. townsendii* in size and color; as described by him, (dark glossy brown, almost black,) the difference is less than I have made it from alcoholic specimens.

I am not prepared to admit the *Scalops aeneus* of Mr. Cassin as distinct from *S. townsendii*. The smaller size would belong to a young specimen, and the peculiar combination of the brassy color with the black nails and feet might be the natural result of long immersion of the animal in alcohol. The dentition is the same with that of *S. townsendii*.

The *Talpa taeniata* of Leconte, founded on the specimen from Oregon, figured by Audubon as having a light stripe on the belly, does not possess sufficient characters for a specific separation. As is well known, the moles, both of Europe and America, are liable to these irregularities of coloration; a specimen of the closely allied *S. breweri* is irregularly blotched in various parts of the body with white, as also one of *S. aquaticus*, (see page 61.)

The difference in dentition between this species and *S. aquaticus* is too great to require any special comparison. From *S. breweri*, with the same number of teeth, it differs in having the anterior middle incisor considerably broader, shorter, and more chisel-shaped; the most posterior premolar is much larger and more trenchant, resembling the molars, and viewed laterally, actually larger than the most posterior molar; in *S. breweri* this tooth has the crown but little longer and no wider than the canine. There is a corresponding difference in the lower jaw.

Measurements (specimens in alcohol.)

Current number.	Locality.	Tip of nose to—				Tail to end of		Length of—		Breadth of palm.	Nature of specimen.
		Eye.	Ear.	Occip.	Root of tail.	Verteb.	Hairs.	Hand.	Foot.		
2212	Steilacoom.	0.73	1.45	2.05	4.98	1.59	1.79	0.91	0.64	0.77	From alcohol.
2209	Petaluma, Cal. . .	0.78	1.16	1.60	4.05	1.48	1.68	0.88	0.80	0.69	-----do-----

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
2005			Steilacoom, W. T.	July, 1856	Dr. George Suckley, U.S.A	119	Skin
1963			do.....	Apl. 5, 1856	do.....	85	do.....
2212			do.....	1856.	do.....		Alcohol...
361	1275		do.....			21	Mounted..
621	1772		Shoalwater Bay.....	Sept., 1854	Dr. J. G. Cooper.	17	Skin
1381		♀	do.....	Aug 30, 1855	do.....		do.....
812			Astoria, Oregon.....		Lt. W. P. Trowbridge, U.S.A		do.....
2209	3112		Petaluma, Cal.	1856.	E. Samuels.....		do.....
2210			do.....	do.....	do.....		Alcohol...
2211			do.....	do.....	do.....		do.....
1288			San Francisco.....	do.....	Dr. J. S. Newberry.....		do.....
2208			do.....		Lt. W. P. Trowbridge, U.S.A		do.....
2673			do.....		Dr. W. O. Ayres.....		do.....

SCALOPS (SCAPANUS) BREWERI.

Hairy Tailed Mole.

Scalops breweri, BACH. Pr. Bost. Soc. N. H. I, 1841, 41.—IB. Bost. Jour. N. H. IV, 1843, 32.

WAGNER, in Wiegmann's Archiv, 1843, II, 31.—IB. Suppl. Schreb V, 1855, 573.

AUD. & BACH. N. A. Quad. II, 1851, 173; pl. lxxiv.

SP. CH.—Teeth 44. Eyes covered by the integument. Ear opening rather large. Nostrils lateral. Palms rather narrow. Tail densely hairy. Color, dark plumbeous, glossed with ashy brown.

Description of a dried skin (No. 319.)—Snout long and slender, somewhat depressed and truncated at the end; naked above, with a few scattered hairs; hairy on the lower part of the sides and beneath; extreme tip of the muzzle naked. Nostrils entirely lateral, opening close to the extremity of the snout; their aperture elongated. Tail short, thick, depressed; everywhere densely covered with hair, with a considerable brush at the end. Fore feet much smaller than in other American species; not much smaller than in *Condylura*; the palms scarcely broader than long (claws excluded). Hind feet likewise very small; the toes cleft to the penultimate articulation.

The fur is long and full, not quite so soft as in *S. aquaticus*. Above, it is of a dark ashy plumbeous from the roots, glossed with ashy brown. Beneath, this latter tinge is more decided, and extends more towards the roots; towards the chin there is infused a slight tinge of reddish-brown. The hands are nearly naked above, probably flesh colored in life, with a few scattered whitish hairs; the upper surfaces of the hind feet are brownish. The claws are whitish, with a subterminal dark spot (at the end of the bone). The hairs on the sides and extremity of the tail are tipped with silvery.

In another specimen from Cleveland, presented by Professor Kirtland, the tail is almost entirely white; and the fur is whitish in spots or patches, distributed irregularly over the body.

The specimen described is very old, as shown by the greatly worn teeth.

General dimensions.

	Inches.	Lines.
Nose to root of tail	5	6
Tail from root to end of vertebræ.	1	1
Tail from root to end of hairs	1	3½
Arm, fore foot to end of claws.....		8½
Arm, longest claw		3½
Leg, hind foot from heel to end of claws		8½
Leg, longest claw		1½
Palm to end of digit		5½
Palm, width		5½
Skull, length		3½

Description from a specimen in alcohol (No. 2205).—The body, though thick and clumsy, is rather more slender than in *S. aquaticus*. The head is rather pointed and elongated, owing to the great development of the muzzle. This projects about .35 of an inch beyond the incisors, or rather more than the distance from the incisors to the angle of the mouth. It is much depressed, and tapers to a rounded truncate tip. It is almost entirely naked above, and laterally almost as far back as the end of the nasal bones, and beneath to the incisors; a few scattered hairs only are visible. There is a broad groove on the underside, from incisors to the bulb or glans of the nose; this is terminal and smooth, the remainder of the muzzle is wrinkled and corrugated; these corrugations on the under side are arranged in parallel lines, running a little backward on each side from the central furrow. The nostrils open on the sides of the terminal bulb, a little obliquely, so as to be slightly visible from above, but not from beneath. Its shape is crescentic, the concavity superior.

The eye is excessively minute, and covered with skin; it is situated a little posterior to the angle of the mouth, and about midway between the tip of the snout and the occiput.

There is no external ear; the meatus is an oval cavity, about one-twelfth of an inch in diameter, situated just above the insertion of the arm.

The palms are about as broad as long, exclusive of the claws, which are long and fossorial, much larger than those on the hind feet. The third is longest, the second about the same size, but not projecting so far; the fourth a little smaller and shorter, the first larger than the fifth. The hind foot is about as long as the fore, much narrower and weaker, however; the relative proportions of the toes and claws much as in the fore feet. The under surfaces of all the feet are perfectly smooth; the upper with scanty hairs; the posterior and lateral margin of the palm is provided with a ciliate border of short hairs.

The tail is thick and blunt at the end, entirely and densely covered with bristly hairs, about .15 of an inch long; it is slightly constricted at the base, and with the hairs about as long as the head.

The longest hairs on the back measure about .35 of an inch, and a little less beneath.

The colors of two specimens in alcohol are much as in the dry skins described, except that there is no white anywhere. Both appear to be of rather immature age, as shown by the

co-existence of deciduous and permanent incisors and premolars. The deciduous upper incisors are small and equal in size, much as in *Talpa europæa*.

Measurements.

Current number	Locality.	Tip of nose to—				Tail to end of—		Length of—		Breadth of palm.	Nature of specimen.
		Eye.	Ear.	Occiput.	Root of tail.	Vert.	Hairs	Hand.	Foot.		
2205	Waterville, N. Y.-----	.75	1.15	1.65	4.00	1.05	1.25	.72	.75	.55	In alcohol.
2206	-----do.-----	.70	1.03	1.43	3.78	1.07	1.24	.68	.67	.48	-----do.-----

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
319	1769	Cleveland, Ohio.-----	Prof. W. H. B. Thomas.-----	Skin.-----
823		-----do.-----	Prof. J. P. Kirtland-----	-----do.-----
2205	3113	Waterville, N. Y.-----	H. Davis.-----	Alcohol-----
2206		-----do.-----	-----do.-----	-----do.-----

CONDYLURA, Illiger.

Condylura, ILLIGER, Prodrömus, 1811, 125.*Astromycter*, HARRIS.*Talpasorex*, SCHINZ.*Rhinaster*, WAGNER, Suppl. Schreb. II, 1843, 113.

Moles with a fringe of elongated caruncles encircling the end of the nose. Nostrils circular, terminal. Tail nearly as long as the body, covered with hair. Auditory opening large.

In the above brief diagnosis are included the most conspicuous features of a remarkable genus of moles, peculiar to the northern portions of North America. At present we are unacquainted with the precise use of the peculiar nasal fringes and the lacinated processes on the under surface of the fingers, so different from what is seen in the other genera.

As I have not been able to discover more than one species of *Condylura* among the specimens before me, I cannot say what are generic and what specific characters. I have accordingly given all its more prominent features in the description of the single species.

The genus was established by Illiger in 1811, and based on a supposed peculiar series of nodes on the tail, caused by its shrinking most around the middle of the vertebræ. It is true that the same thing takes place in the tails of other animals when dried, but the name is as applicable as many others in common use, and will hardly warrant the use of a new name, as contended for by Wagner.

The differences in external form between *Scalops* and *Condylura* are very striking. Thus the former has nothing of the peculiar plates on the entire surface of the hands and feet, nor the flattened scaphoid tubercle on the inner edge of the sole. The hind feet of *Condylura* are considerably longer than the anterior; the palms are relatively smaller, and the digits more deeply cleft. The eyes are larger and the ear much more fully developed. In *Scalops* the tail is much the shortest, and the peculiar fringed radiations on the nose are entirely wanting. The teeth are totally different. The nearest relationship are with *Urotrichus*.

CONDYLURA CRISTATA.

Star-Nosed Mole

Sorex cristatus, LINN. Syst. Nat. (ed 10th,) I, 1758, 53.—IB. (ed 12th,) I, 1766, 73.

ERXLEB. Syst. Reg. Anim. 1777, 121.

SCHREBER, Säugt. III, 1778, 566.

BODDERT, Elenchus Anim. I, 1784, 124.

GMELIN, Syst. Nat. I, 1788, 112.

Condylura cristata, DESMAREST, Jour. de Physique, LXXXIX, 1819, 230.—IB. Mam. I, 1820, 157.

HARLAN, F. A. 1825, 36.

GODMAN, J. A. N. Sc. Phil. V, 1, 1825, 169.

GRIFFITH, Cuv. II, 1827, 210; pl.—IB. V. 1827, 110.

DEKAY, N. Y. Zool. I, 1842, 12.

Rhinaster cristatus, WAGNER, Suppl. Schreb. II, 1841, 117.—IB. V, 1855, 575.*Talpa longicaudata*, ERXL. Syst. Reg. Anim. I, 1777, 118, (from Pennant.)

(ERXL.) SCHREB. Säugt. III, 1778, 561.

SHAW, Gen. Zool. Mamm. I, 1800, 523.

Talpa radiata, SHAW, Gen. Zool. Mamm. I, 1800, 523.

Sorex radiatus, SHAW, Gen. Zool. Mamm. I, 1800, 531; pl. cxxx.

Condylura longicaudata, DESM., Mamm. I, 1820, 158.

HARLAN, F. A. 1825, 38.

GRIFF. Cuv. V, 1827, 110.

RICH. F. B. A. I. 1829, 13.

FISCHER, Syn. 1829, 248.

GIEBEL, Säugt. 1855, 891.

Rhinaster longicaudata, WAGNER, Suppl. Schreb. II, 1841, 116.

Talpa longicauda, BODD. Elench. Anim. I, 1784, 126.

Condylura macroura, HARLAN, F. A. 1825, 39.

FISCHER, Syn. 1829, 248.

THOMPSON, Nat. Hist. Vt. 1842, 28.

?? RICH. F. E. A. I, 1829, 234.

?? WAGNER, in Schreber, Säugt. III; pl. clvi, A (interpolated from Rich.)

?? *Rhinaster macroura*, WAGNER, Suppl. Schreb. II, 1841, 115.

?? *Condylura prasinata*, HARRIS, Bost. Jour. Philos. & Arts. II, 1825, 582 (Maine.)

Radiated mole, PENNANT, Syn. Quad. 1771, 313.—lb. Hist. Quad. 1781, No. 351.—lb. Arctic Zool. I, 1784, 140.

(Sp. in Leverian Mus.)

Long tailed mole, PENN. Syn. 1771, 314.—lb. Quad. I, 1781, 486; Arctic Zool. (2d ed.) I, 1784, 140.

SP. CH.—Tail about as long as body, exclusive of head; color dark-brownish black.

The Star-nosed mole has the general form of the moles, in the thick-set and clumsy body, large palms, &c., as in *Scalops*. There is no distinction of neck, but the head tapers rapidly at first from the occiput, then more gently to the very much attenuated snout. The muzzle, however, is much thicker than in *Scalops*; its tip is truncated perpendicular to its axis, and the margins are extended into a fringe of star-shaped processes, 22 in number, around the circumference, the longest (lateral) measuring about .20 of an inch, and distant .35 of an inch from the centre of the nose. These radiated fringes are symmetrically arranged, eleven on each side, and though varying in length, preserving the bilateral symmetry. The upper on either side have their roots a little further forward than the rest, or nearer the nostrils, which are a little below their thickened base. The nostrils are circular, entirely terminal, in the centre of the snout, and separated by about one-tenth of an inch. The whole terminal portion of the muzzle is naked, including a small space behind the nasal fringes on the upper surface.

On the under surface of the muzzle there is a furrow very deep and short, reaching from the incisors to the tip of the nose. In fact this furrow is formed by the meeting of one on either side, which separates the lips from the gums and teeth; exterior to this, and parallel with it, is a second furrow, which separates a labium on either side, reaching from the angle of the mouth to within one-twelfth of an inch of the end of the muzzle.

The eyes are diminutive, but distinct, with an appreciable palpebral opening, nearly the twentieth of an inch in diameter. It is proportionally as large as in most shrews, and doubtless serves a visual purpose. It is situated about midway between the end of the nose and the centre of the meatus.

There is no external ear projecting above the surface of the skin, but the meatus is very large, placed obliquely and nearly parallel with the top of the head. It is oval, about .30 of an inch in its long diameter, and half as much the other way; an antitragus and antihelix-valve are very distinct, mostly seen below the level of the meatus; and the auricle itself may be considered as indicated by a sharp edge of the skin. The superior and inferior extremities of the small antihelix are united with the posterior edges of the meatus, so as to form a small aperture, or cul de sac.

The edges of the antitragus and antihelix (otherwise naked) are beset by long hairs like those on the rest of the body.

The general character of the ear is as in the short-tailed American shrews, (*Blarina*), with less development of auricle, however; the antitragus and antihelix serve as valves to close the opening into the internal ear.

The hands are broad, but not so large as in *Scalops*, and present a striking resemblance to those of terrapins. There are a few hairs on the back of the hand, near the base, and there is a fringe encircling the entire palm; the rest of the hand, including the whole of the under surface, and most of the upper, is free of hairs, and closely covered with a pavement of brown scales or plates, of nearly uniform size below, but larger near the outer margin above. The whole of the hind foot is similarly constituted as to plates on both surfaces; there are a few hairs near the outer edge of the anterior surface. There is a large, horny tubercle on the inner edge of the sole, midway between the heel and the tip of the first claw, sometimes developed into a process resembling that on the hind foot of a toad; there are three other smaller ones in a line at nearly equal distances near the outer edge.

The hind feet, though narrower than the anterior, are considerably longer. The width of the palm is about half its length, or equal to the distance from wrist to base of fingers. The fingers and their claws in both feet decrease regularly from the fourth to the first; the outer one but little shorter than the fourth. The hand is only webbed between the basal phalanges of the fingers. The outer edge of the under surface of each of the anterior fingers is extended into three lacinated horny processes. These are not found on the hind feet.

The tail is long; without the hairs, about as long as the body, exclusive of the head. It is covered with annulations of rather large, coarse scales, which, however, are much obscured by the long bristly hairs which spring between them. It is much constricted at the base, swells rapidly to the basal fourth, and then tapers gently to the tip. Usually the greatest diameter of the tail is about .20 of an inch; but during the breeding season, by the deposition of fat under the skin, it swells to an enormous size, so as to exceed half an inch in thickness. Specimens vary in the length of the tail, which appears longer in the males than the females.

The fur of this animal is much coarser than in the common mole, and without its lustrous gloss. It consists of two kinds of hair, a basal fur, with longer, coarser hairs, thickly interspersed. The longest measure about half an inch.

The color is a uniform dark, sooty brown, or blackish, barely appreciably lighter beneath. The fur is a dark plumbeous from base to near the sooty tips, a little paler beneath.

The variation in the size and length of the tail has caused the erection of several species of *Condylura*. All that have come under my notice, however, appear to be the same, although it is quite possible that the species from Oregon, described by Richardson as *Condylura macroura* of Harlan, may be distinct.

The skull of *Condylura* presents several peculiarities of great interest compared with that of its allies. It is much longer and more slender in its proportions. The upper outline of the skull is concave, from the posterior third to the nasals, and then straight to the end of the latter, which terminate behind the canines instead of projecting beyond the incisors. The cranium is almost as high as broad; the auditory foramina very large and conspicuous, somewhat as in the shrews. There is a notch in the posterior edge of the palate, reaching to the penultimate molar, instead of this posterior edge being straight, and at some distance behind the last molar.

The dental formula may be given at incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{3-3}{3-3} = \frac{22}{22} = 44$. The anterior upper incisors project nearly horizontally, and are axe-shaped, the crown being sub-compressed, widened suddenly beyond the neck, and having a distant resemblance to the anterior incisor of the shrews. Those of opposite sides lie very close together, making the two halves of a kind of spoon. Next succeeds a very slender thread-like incisor, implanted vertically, and then a long canine-like incisor in immediate contact, and almost as much developed as the canine of *Talpa*. This tooth has a small spur on its trenchant extero-posterior edge. Next, after a considerable interval, comes the diminutive canine with a simple fang, and then succeed three compressed premolars with double fangs, a central large-pointed lobe and two basal ones to each. The last premolar and the three molars are in close contact; the anterior premolars, the canine, and the third incisors, are all separated from each other by considerable intervals.

In the lower jaw the three incisors are directed horizontally forward, the two inner ones combining closely with their fellows of opposite sides, to form one continuous spoon-shaped projection, with difficulty separable into its four components. The exterior incisor is small and thread-like, with difficulty discernible in its situation close to the second incisor. The canine is rather large and distinct, and has a posterior basal fang; the premolars are somewhat like the upper ones, and exhibit the same conditions as to interspaces.

Measurements.

Current number.	Locality.	Tip of nose to—				Tail to end of—		Length of—		Breadth of palm.	Nature of specimen.
		Eye.	Ear.	Occip.	Root of tail.	Vert.	Hair.	Hand.	Foot.		
567	Fort Ripley, Minn	-----	-----	.92	3.25	2.83	3.00	-----	-----	-----	From specimen in alcohol.
568	St. Lawrence co., N. Y.	-----	-----	.92	3.00	2.92	3.33	-----	-----	-----	do
2219	Middleboro', Mass	.68	1.10	1.54	3.62	2.80	3.19	.75	1.17	.45	do
2241	do	.65	1.05	1.58	3.67	2.80	3.00	.63	1.00	.40	do
2242	do	.75	1.26	1.50	3.98	2.83	2.98	.67	1.00	.40	do
2243	do	-----	-----	-----	-----	2.85	3.02	.75	1.03	.40	do
2244	do	.70	1.23	1.50	3.67	2.55	3.00	.78	1.00	.45	do
2245	do	.70	1.15	1.52	4.16	3.03	3.18	.76	1.05	.40	do
2246	do	.65	1.30	1.20	3.68	-----	-----	.75	1.00	.40	do
2217	Essex county, N. Y.	.67	1.20	1.55	3.76	2.80	3.21	.75	1.05	.45	do
2234	Meadville, Pa.	.58	-----	1.50	3.95	2.72	3.07	.70	1.00	.37	do
2235	Waterville, N. Y.	.65	-----	1.60	3.92	2.80	3.05	.75	1.04	.42	do
2218	Carlisle, Pa.	.66	-----	1.53	3.98	2.63	2.83	.74	.90	.45	do

List of specimens.

Catalogue number.	Correspond'g No. of skull.	No. of specimens.	Locality.	When collected.	Whence obtained.	Nature of specimen.
567	1689	1	Fort Ripley, Minn. ....	.....	Dr. J. F. Head, U. S. A..	Skin
-----	-----	4	Halifax, N. S.	-----	Dr. J. B. Gilpin	Alcohol
197	-----	1	Montreal	-----	Thomas Broome..	Skin
-----	-----	1	Middleboro', Mass.	July 5, 1855 ..	J. W. P. Jenks	do
-----	-----	8	do	October..	do	Skin & in alcohol.
1083	-----	1	do	Dec. 16, 1855.	do	Skin
2217	-----	1	Essex county, N. Y.	-----	Dr. S. E. Hall	Alcohol
568	1690	1	St. Lawrence co, N. Y.	-----	E. A. Dayton.	Skin
2235	-----	1	Waterville, N. Y.	-----	H. Davis	Alcohol
861	-----	1	New York city	-----	George N. Lawrence ..	Skin
2233-4	-----	2	Meadville, Pa.	-----	J. F. Thickstun	Alcohol
2218	-----	1	Carlisle, Pa.	-----	S. F. Baird	do
822	-----	1	Cleveland, Ohio	-----	Prof. J. P. Kirtland ..	Skin

UROTRICHUS, Temminck.

Urotrichus, TEMMINCK, Van der Hoeven, Tijdschr. V, 1838.—*Id.* Mag. de Zool. 1842.

Muzzle prolonged into a cylindrical tube, continued some distance beyond the incisors, terminating in a simple naked bulb. Nostrils cylindrical, opening in the side. Eyes and ears concealed. Tail long and hairy. Fore feet moderately large, shorter than the hind feet. Upper and under surfaces of both covered with small plates.

In the above diagnosis I have the pleasure of first introducing a genus of insectivorous mammals into the fauna of North America hitherto only represented by a single species, the *U. talpoides*,¹ from Japan. The specimen is, unfortunately, not quite mature, and the skull, with its dentition, is imperfect, so that I am obliged to rely upon Temminck for the dental formula.

In external form this animal exhibits a close resemblance to *Condylura*, the only striking difference being in the much elongated and tubular muzzle, without radiations, and the nostrils lateral, not terminal. The feet, hands, and tail, are very similar.

The dental formula, according to Temminck, is incisors, $\frac{1-1}{1-1}$; canines, $\frac{1-1}{0-0}$; molars, $\frac{8-8}{7-7} = 36$, or, as there are three true molars, the latter quantity would be divided into: premolars $\frac{5-5}{4-4}$, and molars $\frac{3-3}{3-3}$. The analogy of dentition would, however, make the formula more probably: incisors, $\frac{3-3}{2-2}$; canines, $\frac{1-1}{0-0}$; premolars, $\frac{3-3}{3-3}$; molars, $\frac{3-3}{3-3} = \frac{20}{16} = 36$.

The genus *Urotrichus* in many respects resembles the shrews, and, in fact, may be considered as forming the connecting link between this family and the moles through *Condylura*.

UROTRICHUS GIBBSII, Baird.

Tail as long as the body (exclusive of the head). Color uniform dark sooty plumbeous. Body about $2\frac{1}{4}$ inches long.

This animal, in many respects, bears a close resemblance to *Condylura*, as in color, feet, and tail, from which it is readily distinguished by the much elongated muzzle and the absence of any radiated processes. The size is about that of *Sorex carolinensis*.

The nose is much elongated and projects more beyond the incisors than in *Sorex*. Indeed, it is, for most of its length, a nearly cylindrical tube, scantily covered with short hairs, and terminated by a naked bulb or glans, with the nostrils pierced in the sides. A distinct constriction separates the bulb all round from the hairy portion of the nose. There is a slight furrow on the under surface of the muzzle. The eye and ear cannot be detected in the skin. They are said to be very minute in the Japan species, as in the moles.

The hands and feet are constituted much as in *Condylura*, in having both surfaces tessellated with small isolated plates. These, on the upper surfaces of metacarpus and metatarsus, are thinly covered with long hairs, and in the hind feet, not restricted to the antero-external edge, as in *Condylura*. I do not find in the dry skin the peculiar scaphoid tubercle on the sole, so conspicuous in *Condylura*. The hind foot is considerably longer (by two-thirds) than the fore foot, but narrower. The hind claws are as long as the anterior ones, but more straight, slender, and acute. The fore claws and hands appear less fossorial than in the other moles. The proportions of the digits differ from *Condylura*. Thus the 4th, 3d, and 2d, are successively a little shorter,

¹ See Temminck in *Mag. de Zool.* 1842, plate 55, mammifères.

but much longer than the 1st and 5th, the claws of which reach, respectively, to the bases of those of the 2d and 4th; the first digit and claw consequently shorter than the fifth.

The tail is long; with the hairs, but little shorter than the body, exclusive of the head. It is constricted at the base, thickened somewhat in the middle, and tapers gently to the extremity. It is covered with annulated scales, which, however, are much obscured by the long bristly hairs which spring from between the annuli, and tip the tail in a stiff pencil.

The color is a dark sooty-brown, almost inappreciably lighter beneath. The color almost uniform from the roots; a little more bluish, perhaps, in the covered portion. Some of the hairs are more lustrous than others, and reflect light so as to impart a hoary appearance. The fur is long and not very compact. The longest hairs measure about 0.20 of an inch.

I regret very much that the skull of the only specimen I have seen is much broken, and at the same time so immature that the permanent teeth have not yet fully taken their places. As far, however, as I can make out, the skull is broader, and narrows anteriorly rather more abruptly than in *Scalops*. The nasal bones extend as far as the anterior edge of the upper incisors, as in *Scalops*, not *Condylura*. There may be made out an anterior scalpriform incisor, broader than in *Scalops*, and projecting downward; and behind this two smaller ones of similar shape. The permanent canine is not distinguishable unless this be indicated by the emerging crown of a tooth apparently with two roots. The premolars have each two roots. The molars are three in number.

The lower anterior incisor is much as in *Condylura*, broad, horizontal, and half spoon-shaped.

Measurements (from a dried skin.)

	Inches.		Inches.
From tip of nose to incisors.....	. 30	Breadth of palm.....	. 16
From tip of nose to root of tail.....	2. 25	Length of fore claws	. 15
Tail from base to end of vertebræ.....	1. 36	Length of hind foot (and claws)	. 57
Tail from base to end of hairs	1. 51	Length of longest claw.....	. 14
Length of palm (and claws).....	. 37		

The only specimen hitherto obtained of this species was collected by Mr. George Gibbs, of Steilacoom, and by him presented to Dr. Suckley.

This animal appears rather smaller than the Japanese *U. talpoides*, as described by Temminck. The feet and tail are proportionally larger. The color of *U. talpoides* is maroon-brown.

List of specimens.

Catalogue number.	Corresponding No. of skull.	When collected.	Locality.	Whence obtained.	Original number.	Nature of specimen.	Collected by
662	1843	July, 1854	White River, Cascade Mountains, W. T.	Dr. George Suckley, U. S. A.	15	Skin.	George Gibbs..

SUB-ORDER.

CARNIVORA.

Incisors six in each jaw ; the lateral ones largest. Canines distinct, conical. Clavicles imperfect or wanting.

The above phrase characterizes the great division of the *Carnivora* as to its essential points. The *Insectivora*, to which they are closely allied, have the central incisors as large or larger than the lateral ; the canines less distinct ; the clavicles perfect. There are many other features, however, in which the *Carnivora* exhibit their claim to a separate subdivision of the animal kingdom.

Osteologically the *Carnivora* are characterized by the fact that the clavicles are either wanting or else quite rudimentary. There are six incisors in each jaw, the outer the largest. There is a distinct canine on each side of each jaw, just behind the incisors ; they are generally very large, conical, and deeply implanted by a single fang (in the upper jaw just behind the intermaxillary). The incisors and canines vary but little, comparatively, in the different genera and families. The molars, on the contrary, differ very much as to number and shape. In this character is a striking difference from the *Insectivora*, where, with a nearly constant type of molars, the canines and incisors differ exceedingly.

As a general rule it is the premolars of the *Carnivora* which play the most important part in the series of cheek teeth. In nearly all of the families, one of these on each side, in each jaw, is so arranged with compressed and cutting crowns, that those of opposite jaws, on either side, play against each other and serve to divide the food like a pair of shears. Others have, either in addition to, or instead of this arrangement, molars with tuberculous crowns for more readily crushing bones or other hard substances. Immediately behind each canine are one or more comparatively small teeth, with conical or compressed crowns, and simple or double fangs. These are often absorbed or wanting in age. Next come the sectorial teeth, as described above. Behind the sectorial teeth are one or more teeth with tubercular crowns. The habits of the species depend much on the relative number and development of these two kinds of molars, whether trenchant or tuberculous ; when the former predominate, the food is more exclusively the flesh of animals, while the opposite condition indicates sustenance of a more mixed nature.

The order of *Carnivora* is usually divided into six families: the *Felidae*, *Hyaenidae*, *Canidae*, *Viverridae*, *Mustelidae*, and *Ursidae*. Of all these, North America possesses representatives, excepting the *Hyaenidae*. Of the *Viverridae* there is but one genus known in America, namely, *Bassaris*. At one time it was believed that fossil remains of *Hyaenidae* occurred in the bone caverns of Brazil ; these are now with more probability referred to a genus *Smilodon*, very closely allied to, if not identical with, *Machairodus*, an extinct genus of *Felidae*, first discovered in Europe, but recently shown by Dr. Leidy to exist in the Mauvaises Terres of Nebraska.

The North American families may be grouped as follows :

A. DIGITIGRADE. Hinder feet with four toes.

Felidae.

Canidae.

B. DIGITIGRADE. All the feet with five toes.

Viverridae.

C. PLANTIGRADE. All the feet with five toes.

Mustelidae.

Ursidae.

Many systematic writers divide the Rapacia into three sub-orders: *Insectivora*, *Carnivora*, and *Omnivora*; the latter constituted by the family of *Ursidae*. Although in some respects this arrangement may be preferable, yet for my present purposes the one adopted above has the advantage of greater simplicity.

FAMILY.

FELIDAE.

Head short, broad. Feet digitigrade; five toes before, four behind. Claws retractile into a sheath. Molars, (with premolars,) $\frac{4-4}{3-3}$ or $\frac{3-3}{3-3}$. Incisors, $\frac{6}{6}$. Posterior upper molar, (true molar,) very small.

By the retractile and very sharp and compressed claws, the cats are very readily distinguished from the closely allied members of the order *Carnivora*. Here, too, the dentition is reduced to its simplest elements among all those mammals having incisors, canines, and molars. The entire number of mature teeth consists of 28 or 30, namely, incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars, $\frac{2-2}{2-2}$, molars $\frac{1-1}{1-1}$. The true or permanent molars are only one in each jaw, on either side, reduced to the minimum of development; usually with but one fang.

As in the *Canidae*, the hind feet have but four toes; the anterior, five. The soles are densely hairy, with naked pads under each toe and on the ball of the foot. The inner toe of the fore foot is placed nearly at the same level with the others, and provided with a strong claw. The tongue is covered with sharp prickles, pointing backwards, which, in the larger species, can readily draw blood by scratching off the skin.

The canines of the *Felidae* are very well developed, and more or less curved; they are usually slightly compressed, very much so in the extinct *Machairodus*; there is an anterior and posterior ridge serrulated in *Machairodus*. In most living cats, the upper canines exhibit each two longitudinal furrows on the outer side, sometimes obliterated by age. The posterior molar of the upper jaw, the only permanent molar, is very small, (not visible from outside,) and its crown is transverse; anterior to this is the large sectorial tooth, a premolar, with a smaller tricuspid one in front of it. The first premolar is very small, and wanting altogether in *Lynx*. In the lower jaw the posterior (true) molar is sectorial with two smaller compressed premolars anterior to it. The second upper, and first and second lower premolars, are trilobed, the central lobe highest, the lateral sometimes with accessory notches or lobes.

In osteological characteristics, and especially in the structure of the skull and teeth, the *Felidae* exhibit a close relationship. In America, however, there may be distinguished two primary living forms, one with compact fur, long tail, high shoulders, and with four molars above; the other with loose, sometimes very long fur, without the brilliancy of the other division; short truncated tail, pencilled ears, high hind legs, and but three upper molars on each side. The former embraces the typical cats of the restricted genus *Felis*—the latter the species of *Lynx*. The extinct genus *Machairodus*, and perhaps another, is found among the remains of the Mauvaises Terres.

FELIS, Linn.

Felis, LINNÆUS, *Systema Naturæ*, I, 1735.

GEN. CH.—Molars $\frac{4-4}{3-3}$; the anterior premolar very small. Tail usually as long or longer than half the body, exclusive of the head and neck.

The true cats are most readily distinguished from the lynxes, in external form, by the long and tapering (sometimes tufted) tail, always as long and sometimes much longer than half the body, exclusive of the head and neck. The fur is close, compact, and glossy, sometimes with symmetrical patterns of coloration; the body slender; the ears without any pencil of hairs at the tip. As stated by Keyserling and Blasius, and of pretty general application to the smaller cats, the anterior process of the frontal and the posterior of the intermaxillary bones do not come close together, so that the maxillary lies in direct contact with the nasal. The molars above are four; the posterior lower molar is bicuspid, its points about equal to each other; the section between the two lying in the middle of the tooth.

At the present time there are five true cats known to occur within the limits of the United States, all, indeed, inhabiting the lower Rio Grande. Of these, three are unspotted, namely: *F. concolor*, (panther) *eyra*, and *jaguarundi*; and two spotted, the *F. onça* and *pardalis*, (jaguar and ocelot.)

Dentition.—Taking the panther or cougar (*Felis concolor*) as the type of the American cats, the dental formula is as follows: Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{2-2}$; molars, $\frac{1-1}{1-1} = 30$. The two inner incisors on each side are about equal, the innermost one a little the smallest; their crowns are wedge-shaped anteriorly, the cutting edges of all in one transverse straight line, bounded by the tubercle of the exterior incisor. The edges of the lower incisors somewhat similarly shaped, fit into a groove of the line of upper incisors, situated just behind their wedge-like edges. The upper outer incisor is two or three times the size of the rest, and has a pointed apex dipping below the plane of the others, and from this a sharp ridge extends along the outer side of the tooth. The notch posterior to the lower end of the central incisors is continued along the outer side of the tooth, just behind the sharp ridge mentioned. There is a considerable space between the incisors and upper canine. The canine is slightly curved, conical, except on the inside in a line with the axis of the molars, where it is more flattened and bounded anteriorly and posteriorly by a sharp ridge. The exterior face exhibits no traces whatever of the usual two longitudinal grooves of the *Felidae*.

The first premolar is separated from the canine and second premolar, each by an interspace equal to the diameter of its alveolus, or less. It is a simple tooth, with a depressed ridge, having a slight central tubercle, and placed in the line of the molars and rather nearer the inner edge than the outer. The second premolar has a compressed conical trenchant crown, with two notches on the posterior edge, embracing between them a second distinct lobe. There is also a slight serrated notch on the middle of the anterior edge, producing a single slight lobe; this lobe, however, is readily worn off, and, at any rate, is not visible without turning the tooth a little round. The portion of the tooth exterior to the cutting edge, exceeds that interior to it. The base of the crown posteriorly constitutes a slight rim or raised edge, bounding the small supplementary lobe described.

Immediately succeeding, and in contact with this tooth, is the third premolar or sectorial tooth. The transverse section of this tooth would be a narrow isosceles triangle, the apex posterior, and the base slightly notched or emarginated for the reception of the preceding tooth. Viewed laterally, the lower or cutting edge of this tooth is divided into three angular lobes by two angular notches. The middle lobe is longest and descends deepest, its straight edges nearly at right angles; the lobe is directed a little backwards. The anterior lobe is small, and occupies about one-fourth the length of the tooth. The posterior lobe is about as long as the middle one, its lower edge extending to the posterior edge of the tooth and forming an obtuse angle with the posterior edge of the middle lobe. There is a rounded excavation at the base of the notch separating these last two lobes, on the outer surface of the tooth. The inner anterior angle of the triangular crown is constituted by a tubercle, from which passes a sharp ridge to the tip of the central lobe. The single true molar is very small, its crown transverse, with a central tubercle, and so placed within the tooth in front of it as to be visible only in part from outside.

The lower incisors are smaller than the upper, and exhibit a gradual increase in size to the outer one. They are wedge-shaped, and there is a low tubercle on the outer edge of the trenchant crown separated by a notch. The lower canines are like the upper ones, only more curved, the anterior outline being more convex and the posterior more concave. The anterior sharp ridge is seen to be more in the middle of the inner face of the tooth. The first and second premolars are somewhat similar; the latter longest and highest; each shows a trenchant compressed cutting edge, with a central angular lobe (its transverse section triangular) with a smaller one at the base on each side. There is also a slightly raised rim to the posterior extremities of these teeth bounding the small basal lobe. In some cases a slight notch divides the anterior basal lobe of the second premolar into two. The posterior or true molar is entirely trenchant, without any internal lobe. It is divided by an obtuse angled rectilinear notch into two lobes, the anterior smallest, with a closed slit dipping down vertically from the bottom of the notch, inside of which the tooth is considerably excavated.

The lower incisors are immediately succeeded by the canines. There is a considerable interval between the canines, however, and the first premolar, fully equal to the length of the latter tooth.

The deciduous dentition of the panther is, incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{3-3}{2-2} = 26$. In one specimen (No. 1110) the permanent first and second incisors of both jaws have supplanted the others; the new canines have not yet pierced the gum; the first upper permanent premolar has taken its place; the other premolars not visible; the true molars above and below are visible in the cleaned and dried skull, but had not pierced the gum. There is an obsolete groove down the outside of the fang and collar of the upper canine, but none on the crown. The first molar has already been replaced by its successor; the second is like the third permanent premolar, and is the sectorial tooth. The central lobe is, however, more acute and nearly in the middle of the tooth, occupying about the central third. The inner tubercle and fang are also immediately above this central lobe, and thus opposite the middle of the tooth. The anterior lobe is also divided into two by a notch. The third molar is small, the crown transverse and emarginate externally; the two roots in a transverse line; the section of the crown is an elongated triangle, the apex pointing inwards.

The lower deciduous canine is more compressed laterally than its successor, and has a small tubercle on the anterior portion of its inner face. The first and second molars resemble, respectively, the second and third permanent molars more than they do their immediate successors

The first has a central sharp lobe, with a basal one anteriorly and two posteriorly, or rather with that number of notches, giving rise to the same number of lobes. The second molar, in addition to the sectorial portion, resembling the permanent lower sectorial, has two notches on its posterior edge, cutting off that number of angular small lobes.

FELIS CONCOLOR, Linn.

The American Panther.

Felis concolor, LINN. Mantissa, 1771, 522; pl. ii.

ERXLEBEN, Syst. Anim. 1777, 511.

SCHREBER, Säugt. III, 1778, 394; pl. civ, (ex Buffon.)

BODDAERT, El. Anim. I, 1784, 90.

TEMMINCK, Mon. de Mammif. I, 1827, 134.

HARLAN, F. Am. 1825, 94.

GRIFF. Cuv. V, 1827, 163.

FISCHER, Syn. 1829, 197.

Pr. Comm. Sc. Zool. Soc. Lond. I, 30, 158.—*Id.* II, 1832, 62. (Period of gestation, 96 to 97 days.)

DOUGHTY, Cabinet, II, 1832, 25; pl. iii.

MARTIN, Pr. Zool. Soc. Lond. I, 1833, 120 (Anatomy.)

WAGNER, Suppl. Schreb. II, 1841, 461.

DEKAY, N. Y. Zool. I, 1842, 47; pl. ix, f. 1, 2.

AUD. & BACH. N. A. Quad. II, 1851, 305; pl. xcvi, xcvi.

BURMEISTER, Thiere Brasiliens, I, 1854, 88.

Felis discolor, SCHREBER, Säugt. III, 1778; tab. 104 B. (Interpolated at much later date.)

Felis puma, SHAW, Gen. Zool. I, 1830, 358; pl. cxxxix.

“TRAILL, in Mem. Wern. Soc. IV, 2”

Puma, PENN, Hist. Quad. 1781, No. 160.—*Id.* Arctic Zool. I, 1784, 49.

Le cougar, CUV. & ST. HILAIRE, Hist. des Mammif. II, 1819. (Plate and text not paged.)

Sp. CH.—Body considerably larger than that of the common sheep. Tail more than half the length of head and body. General color above, a uniform pale brownish-yellow, finely mottled by dark tips to all the hairs. Beneath, dirty white. A black patch on the upper lip, separated from the nose by a triangular white space. Convexity of ear black; tip of tail dusky. No spots or blotches on the body in the adult; a few obsolete ones in the half-grown young. Kittens with the body densely spotted and the tail ringed.

This species is the second in size of the North American cats, being exceeded only by the jaguar. It is considerably larger than the largest dogs, the weight, according to Audubon, amounting sometimes to 150 pounds. The hair is, throughout, short and compact, close pressed to the skin, but not very glossy; it is longest on the belly. The head is small; the ears large and rounded above; the whiskers in about four horizontal series. The paws are very large and with pads, as described in the other cats. The tail is rather more than half as long as the head and body together; it is cylindrical to near the end, where it is rather more bushy and has a decided brushy tuft at the end, differing in this respect from the description of Audubon and Bachman, and others.

In color this species is not dissimilar, seen from a distance, to the Virginia deer—like it, varying with season in the precise tint. It is entirely unspotted in the adult state, the only dark markings consisting in a black patch on the upper lip over the insertions of the moustaches and the convexity of the ear, which is uniform dusky black, (in some specimens with a gray spot, according to authors.) The back and sides are a tawny brownish-yellow, with a wash of darker on the dorsal line. The under parts are dirty white. The tail corresponds with the body as to the upper and under surfaces; towards the end, however, and especially in the brushy

tip, there is a sooty tinge. The long hairs of the body above are of a pale brownish-yellow, with the tips black. This gives a very fine and indistinct mottling to the color, and occasionally the accidental aggregation of these tips conveys the idea of small dark blotches or lines, which, however, have no real existence in the adult.

A young specimen (124) agrees in general characters with the above, except that the hair is considerably longer, owing perhaps to its colder locality. The tail tapers gradually from a thick base to a rather slender tip, which is slightly bushy. There are a few obsolete dusky blotches on the back and the sides of the legs. The ears are entirely black on their convexity, and the tail is much more dusky at the tip.

Measurements.

	165.	124.
	Inches.	Inches.
Length, nose to root of tail.....	56.	34.
Length, root of tail to end of vertebræ.....	32.	16.
Length, root of tail to end of hairs.....	33.	17.
Height of ear above skull	3.	2.
Length of skull	7.75	5.06
Width of skull.....	4.93	3.43

The American panther or cougar is tolerably abundant throughout the whole of North America, as far north as 50° or 60°, especially in the line of the mountains. Southward it reaches the very extreme point of the continent of South America, to about 50° S. E., having thus an extreme range of about 110 degrees, exceeding any other cat in extent of distribution. Lieutenant Gilliss brought a fine specimen from Chile.

A specimen from the Brazos river, in Texas, collected by Captain Marcy, is rather redder than the one described above, and it is probable that the species varies considerably with season.

Young.—A pair of kittens from Fort Steilacoom, W. T., (1021, 1022), brought by Dr. Suckley, and probably of this species, have the upper parts and sides of a pale, rusty gray, with numerous distinct round blotches (largest on the middle of the back), scattered quite uniformly. The ground color of the belly is rather lighter than that of the back, the two passing insensibly into each other along the sides. On the lower parts of the sides may be distinctly made out a series of narrow transverse bars, meeting in the central part of the belly, the posterior portion of which, however, is immaculate, and rather more white than elsewhere. The tail shows three transverse dark bars above, besides a terminal one, these occupying nearly the whole upper portion, the rings indeed extending all round. The exterior surface of the ear is densely hairy and entirely white; the interior is entirely black, without any spot; there is a sooty patch on the neck, within and behind the ear, and a considerable suffusion of the same over the whole throat. The eyelids are broadly dark, sooty brown, as is also a spot above and a bar behind the eye. There is also a broad stripe of black, from the anterior canthus, along the nose and upper lip, involving the whiskers. There is no trace of the narrow lines of black along the rows of whiskers of the wild cats, the whole being confluent black.

Head and body, 15 inches; tail, with hairs, 5½ inches.

Skull.—The lateral profile of the skull of the American panther is gently convex, except a slight concavity near the anterior extremity. When laid with the lower jaw in place on a table, the most elevated portion of the skull is a little anterior to the centre of the profile. This uppermost portion of the skull is somewhat flattened, and generally a little concave from side to side. The top of the nose is rather flattened, and the posterior ends of the nasal bones are united to the frontal in a sudden depression of the latter bone, so that there seems a decided indentation in the top of the head at this point. There is a considerable concavity alongside of the muzzle above the anterior base of the zygoma. The nasal processes of the temporal bone are short, and do not reach as far as the anterior face of the anterior root of the zygoma; it is separated from the nasal process of the intermaxillary by nearly one-third the exterior margin of the nasal bone, for which space the maxillary is in direct contact with the nasal. The most remarkable peculiarity of the upper part of the skull is seen in two narrow laminae (one on each side), which run upwards and inwards from the parietal bones through the frontal, and are bounded by the temporal crests. These laminae are sometimes more than half an inch long, and two lines wide.

The posterior margin of the bony palate is somewhat like a gothic arch, pointed anteriorly. The palato-maxillary suture is Λ -shaped, the acute angles anterior, the suture commencing in a notch, just withinside of the last upper molar, and running forward and inward in a zigzag manner, nearly opposite the middle of the second premolar, when it turns backwards and inwards at a little less than a right angle, to meet its fellow in the middle of the palatine suture; this point is opposite the junction of the second and third premolars. The maxillo-intermaxillary suture, passing in a slightly sinuous manner across from a little behind the middle of the inner alveolar border of the canines, proceeds backwards and inwards to the maxillary suture, the line being nearly parallel to the re-entrant lines of the palato-maxillary suture. There is a small portion of the incisive foramina in the maxillary as a small notch. These foramina are large, elongated, and are deeply channelled out, anterior to the incisors.

The bony palate is decidedly depressed at the anterior part of the palatine suture. There are two distinct and flattened ridges along the outer limb of the palato-maxillary suture, continued anteriorly to a line with the inner edges of the incisive foramina and the channels leading from them; exterior to these ridges is a longitudinal shallow concavity.

The lower outline of the lower jaw is somewhat bow-shaped, a convexity anterior to the middle, with a gentle concavity from this to either end. The anterior extremity of the jaw is plane or obliquely truncate.

The teeth of the cougar exhibit the same general structure with those of the other large cats; the canines are, however, very large and thick, and in no one of ten or more skulls have I ever seen any indications of the two longitudinal grooves of the outer face of the upper canines, so common in the cats, and most marked in the lynxes.

I have not had an opportunity of comparing the skull of the cougar or American panther with that of its nearest relative, in point of size, the jaguar; judging from figures, however, it is much the slenderer of the two. The proportions of the skull, namely, the greatest width about two-thirds the axial length, appears the same as in the ocelot, *Felis pardalis*.

List of specimens.

Catalogue No.	Correspond'g No. of skull.	No. of specimens.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Collected by
				Chile -----		Lt. Gilliss, U. S. N. -----		Skin & skel. -----	
1355-6		2		Matamoras, Mexico -----		Lt. D. N. Couch -----		Skull -----	Dr. Berlandier -----
1148	165			Eagle Pass, Texas -----		Maj. W. H. Emory -----		Skin -----	A. Schott -----
1005				San Elziario, Texas -----		do -----		Skull -----	J. H. Clark -----
				Brazos river, Texas -----		Capt. R. B. Marcy -----		Skin -----	
1110	124		o	Copper Mines, N. M. -----	1851	Col. J. D. Graham -----		do -----	J. H. Clark -----
1604				San Diego, Cal -----		Dr. J. F. Hammond -----		Paws -----	
1941-2		2		Petaluma, Cal -----		E. Samuels -----		Skin -----	
1021			o	Fort Steilacoom, W. T. -----		Dr. George Suckley -----	62	do -----	
1022			o	do -----		do -----	69	do -----	
2003			Ad.	do -----		do -----	115	Paws -----	
				Fort Union, Neb -----		A. Culbertson -----		Skull -----	
				Capon Springs, Va -----		Dr. Kennerly -----		Skeleton -----	
1157-8		2		Prairie Mer Rouge, La -----		James Fairie -----		Skull -----	

FELIS ONÇA.

The Jaguar, or American Tiger.

Felis onça, LINN. Syst. Nat. ed. 12, 1766, 61.

Gm. Syst. Nat. I, 1788, 77.

SCHREBER, Säugt. III, 1778, 388; pl. cii. (On plate. *Der Jaguar* in the text.)

DESM. Mamm. I, 1820, 219.

TEMM. Mon. Mamm. I, 1827, 136.

HARLAN, F. Am. 1825, 95.

HAM. SMITH, in Griff. Cuv. II, 1827, 454, 455. (Plates of two varieties.)

WAGNER, Suppl. Schreb. Säugt. II, 1841, 474.

AUD. & BACH. N. A. Quad. III, 1853, 1; pl. ci.

BURMEISTER, Thiere Brasiliens, I, 1854, 84.

Felis panthera, SCHREBER, Säugt. III, 1778; tab. lxxx, lxxix. (From Buffon.)

"*Tigris Mexicana*, HERN. Thesaurus, 498."

Le jaguar, ST. HILAIRE & CUV. Hist. Nat. des Mammif. II, 1819. (Two plates.)

SP. CH.—Size considerably larger than that of the American panther, (*Felis concolor*.) Tail less than half the length of the body and neck, exclusive of the head. Ground color above, clear brownish-yellow; beneath, white, spotted. No distinct stripes visible, excepting on the lower half of the back on the vertebral line where the blotches are confluent. On the shoulders and anterior to it, the blotches are full and small. On the sides of the body is a series of polygonal figures, with the borders composed of black blotches enclosing a light area, with a few blotches in the centre.

For a detailed description of the jaguar, I will refer to the report on the mammals of the United States and Mexican Boundary Commission. The species is found in the United States as far north as Red river of Louisiana.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
168	Brazos river, Texas -----	J. M. Stanley -----	Skin. -----
1309	Brazil -----	T. Ewbank -----	do -----
2293	Paraguay. -----	Capt. T. J. Page, U. S. N. -----	Skin in alcohol -----

FELIS PARDALIS, Linn.

Ocelot ; Tiger Cat.

Felis pardalis, LINN. Syst. Nat. I, 1766, 62. (In part.)

SCHREBER, Säugt. III, 1778, 390 ; tab. ciii (from Buff., called *der ozlot* in text).

DESM. Mam. I, 1820, 222.

HARLAN, Fauna Amer. 1825, 96.

TEMM. Mon. de Mam. I, 1827, 144.

WAGNER, Suppl. Schreb. II, 1841, 496.

AUD. & BACH. N. Am. Quad. II, 1851, 250 ; pl. lxxxvi.

Quid, *F. armillata*, F. CUV. Mamm.

F. griffithi, SMITH, Griff. Cuv. II.

F. catenata, GRIFF. Cuv. II, 478 ; plate.

SP. CH.—Size about that of the American wild cat. Tail not half as long as the body and neck (exclusive of the head). Ears black, with a white spot. Tail above, black, with narrow bands of white. Fine stripes on the back of neck with lighter intervals. A dorsal series of full black blotches, sometimes more or less continuous. The rest of back and sides showing a grayish network enclosing angular blotches, more or less elongated, black externally, brownish yellow in the centre ; those blotches next the dorsal line more serial and smaller.

This species is found all through the lower country of Texas, and ranges as far north as Red river.

For a detailed description of the skin and skull of this species, see the report of the United States and Mexican Boundary Survey.

List of specimens.

Catalogue number.	Corresponding No. of skulls.	Locality.	Whence obtained.	Nature of specimen.	Collected by
25	-----	Eagle Pass, Texas ---	Col. S. Cooper, U. S. A -----	Skin -----	-----
129	1115	-----do-----	Major W. H. Emory, U. S. A -----	do -----	A. Schott -----
235	-----	Matamoras, Mexico --	Lieut. D. N. Couch, U. S. A -----	Skin, (kitten) -----	Dr. L. Berlandier..
2291	-----	-----do-----	-----do-----	In alcohol -----	-----do-----

FELIS EYRA, Desm.

Tiger Cat.

Felis eyra, Desm. Mamm. I, 1820, 231.

"Max. Beit. II, 381."

WAGNER, Suppl. Schreber, II, 1841, 544.

BURMEISTER, Thiere Brasiliens, I, 1854, 90.

Felis unicolor, TRAILL, in Mem. Wern. Acad. III, 178; pl. x.

BERLANDIER, MSS. pl. ii.

SP. CH.—Size of the house cat, but with longer neck, and general form more musteline. Tail rather longer than the body, exclusive of the neck and head. Color, uniform brownish red, a little paler beneath. (Hairs not annulated?)

The introduction of this species into the fauna of North America is based on a skull in the Berlandier collection, (No. 1373,) obtained at Matamoras; and on drawings and descriptions in the Berlandier manuscripts. It ranges from Guiana to Mexico, and through the latter, probably near the coast, to the Rio Grande of Texas.

For full accounts of the species, see the report on the mammals of the United States and Mexican Boundary Survey.

FELIS YAGUARUNDI, Desm.

Felis yaguarundi, Desm. Mam. I, 1820, 230.

TEM. Mon. Mam. I, 1827, 139.

"Max. Beiträge, II, 381."

WAGNER, Suppl. Schreb. II, 1841, 512.

"WATERHOUSE, Zool. Beagle, II, 16; pl. viii."

GRAY, Knowsley Menagerie, 1846; pl. iv.

BURMEISTER, Thiere Brasil. I, 1854, 90.

Felis mexicana? Desm. I, 1820, 230.

Felis cacomill, BERL. MSS.

SP. CH.—Larger than the largest common cat; much more elongated. Tail as long as the body, exclusive of the neck and head. Prevailing color, a continuous grizzled brownish gray, without any spots. Hairs annulated and tipped with black. Young rather more rufous.

A skull (No. 1426) of this species, in the collection of Dr. Berlandier, collected at Matamoras, with a full description of the animal by him, establishes a more northern range for this species than has hitherto been accorded. In its southern range it reaches as far as Paraguay.

A full description of the skin and skull of this species will be found in the zoological report of the United States and Mexican Boundary Survey.

LYNX, Raf.

Lynx, RAFINESQUE, Amer. Month. Mag. I, Oct, 1817, 437.—*Id.* II, 1817, 46.

AUD. & BACH. N. A. Quad. I, 1849, 1.

Lynxus, "GRAY." DEKAY, New York Zool. I, 1842, 50.

GEN. CH.—Molars $\frac{3-3}{3-3}$, the small anterior premolar of *Felis* wanting. Tail considerably less than half the body, exclusive of head and neck, generally not much longer than the head, and abruptly truncate at tip.

In addition to the above characters Keyserling and Blasius distinguish the Lynxes from the cats by the fact that the anterior process of the frontal extends beyond the middle of the nasal, and coming in contact with the intermaxillary excludes the maxillary almost entirely from contact with the nasal. The last lower molar has a small posterior accessory cusp, the section between the two principal points lying anterior to the middle of the tooth.

There are four Lynxes found within the limits of the United States: one, *L. canadensis*, of large size, and the pads of the feet overgrown with hair, so as to be completely concealed in winter; the other three of smaller size, more naked soles, and more southern in locality, namely, *L. fasciatus*, *L. rufus*, and *L. maculatus*.

Skull.—It is unnecessary to describe in very minute detail the skull and teeth of the genus *Lynx*, as they agree in the main with *Felis*. The most appreciable difference is found in the constant deficiency, even at a very early age, of the first upper premolar, giving rise to the dental formula of incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{2-2}{2-2}$, molars $\frac{1-1}{1-1}$, = 28.

As already stated, the differences in the skull of *Felis* and *Lynx* can best be expressed by a comparison of the two. In *Lynx* the skull is broader; the cranium more capacious; the forehead higher and more arched; the muzzle broader; the zygoma longer, much higher, and extending farther backwards; the point of the orbital process of the frontal bone is rather behind the middle of the longitudinal axis of the skull, instead of being considerably anterior to it. The elevated and compressed median crest of the parietal bone, extending on the frontal, as seen in the adult *Felis*, is never found in *Lynx*, where the temporal ridges of opposite sides are always separated by a smooth plane surface as far back as the middle of the parietal bone.

The under surface of the skull likewise exhibits constant differences. Thus the incisive foramina are much smaller, although a groove is continued to the base of the inner incisor. The posterior margin of the bony palate, instead of being acutely emarginate in its central portion, is more or less transverse, (with one or two exceptions,) and even extending farther back in the middle than laterally. The whole palate is broader. The emargination of the palate, just within the molars, is also more transverse, less deep, and shallower. The suture of the palatine bones with the palatine plate of the maxillary, instead of projecting far forward, as an angle on either side of the centre of the palate, has the anterior line nearly transverse.

The lower jaw is generally thicker and more massive; the ramus anteriorly bent more inwards; the end broader.

There is no appreciable difference in the teeth, of generic value, with the exception of the constant absence, at all ages, of the first upper premolar. The resemblance in the temporary dentition of the two genera is equally close; the first premolar being likewise wanting.

LYNX RUFUS.

American Wild Cat.

- Felis ruffa*, GULDENSTAEDT, Nov. Comm. Petrop, XX, 1776, 499.
Felis ruffa, SCHREBER, Säugt. III. 1778, 412; pl. cix A (*Rothluchs* in text).
 SHAW, Gen. Zool. I, 1800, 373, (from Pennant.)
 DESM. MAM. I, 1820, 225.
 HARLAN, F. Am. 1825, 99.
 TEMM. Mon. Mamm. I. 1827, 141.
 SMITH, in Griff. Cuv. V, 1827, 150.
 F. Cuv. Suppl. Buff. I, Mamm. 1831, 463.
 WAGNER, Suppl. Schreb. II, 1841.
Lynx rufus, RAF. Am. Month. Mag. II, 1817, 46.
 AUD. & BACH. N. A. Quad. I, 1849, 2; pl. i.
Lyncus rufus, DEKAY, N. Y. Zool. I, 1842, 51; pl. x, f. 1.
Lynx montanus, RAF. Am. Month. Mag. II, 1817, 46, (Catskills.)
Felis montanus, HARLAN, F. A. 1825, 101.
 LECONTE, Pr. A. N. Sc. Ph. VII, Jan. 1854, 9.
Lynx floridanus, RAF. Am. Month. Mag. II, 1817, 46.
 Bay Cat, PENN. Syn. 1771, 188; pl. xix, f. 1.—*Id.* Hist. Quad. 1781, no. 171; Arctic Zool. I, 1784, 51.
 Mountain Cat. Penn. Hist. Quad. 1781, no. 168.—*Id.* Arctic Zool. I, 1784, 51.
 ? *Lynx*, Penn. Hist. Quad. 1781, no. 170.—*Id.* Arctic Zool. I, 1784, 50.

Sp. CH.—Fur moderately full and soft. Above and on sides pale rufous, overlaid with grayish; the latter color most prevalent in winter. A few obsolete dark spots on the sides and indistinct longitudinal lines along the middle of the back. Collar on the throat like sides, but much paler. Beneath, white spotted. Inside of fore and hind legs banded. Tail with a small black patch above at the end, with indistinct subterminal half rings. Inner surface of ear black, with a white patch.

Winter dress.—Yellowish ash, with a rufous tinge; the soft woolly hair yellowish at base, then light brown; the terminal and longest portion pale chestnut brown. The long stiff hairs are annulated with black and grayish white, the latter color being broadly subterminal and causing the general tinge of the outer plumage. Nearly all these hairs are, however, tipped more or less with black. Scattered through the color of the back and sides, as indicated, are some very indistinct blotches of dusky; while along the middle of the back are some equally obsolete short lines of the same. The outside of the limbs is like the back, with the blotches, however, rather more distinct. The under parts are yellowish white, with a slight tinge of pale chestnut across the throat; the belly is blotched rather largely with dark brown, while the insides of the legs are transversely barred at their upper part with the same. There are a good many indistinct longitudinal narrow lines of dusky on the crown; more distinct lines pass through the series of whiskers, and others commencing under the eye extend backwards on the cheeks, widening and more distinct in the ruff. The ears are black, externally, with a large central patch of grayish white. The tail is white beneath, and at the extreme tip; above, it is like the back, with a square black patch at the end, and several transverse narrow bars of the same. The square black patch at the tip is quite limited, not amounting to more than three quarters of an inch in either dimension.

In summer the grayish tips to the hairs are less distinct, and a more reddish tint is then evident. The fur is also shorter and thinner.

These specimens agree very well with each other, the fur of 169 being much softer than the rest, but still inferior to that of *Lynx fasciatus*. Specimens from California differ in some points as follows:

⁶⁶⁰/₁₈₇₆, Bodega, Cal. ♀. Hair coarser, stiffer, rather shorter; larger part of back darker, and brownish rusty; sides gray; line of demarcation distinct. In No. 245 colors more blended.

In middle of dorsal region the hairs are almost entirely black beneath the surface, a separation of the fur exhibiting a very slight base of lighter ashy on the fur, then black, and the long stiff hairs tipped with pale brownish rusty. On the sides the soft wool is yellowish white at base, then pale-sooty brown, then pale rusty. The coarse hairs are whitish at base and subterminally with a ring and tip of black. In 245 there is much less black on the back, this color in no case reaching to the roots.

The lower parts of the sides show more gray and less rusty than in No. 245.

There is an indistinct but rather light gray line down the anterior face of the hind legs, with rufous on either side; this is not discernible in 245. The inferior velvety portion of the posterior surface of the hind foot from the soles (inclusive) to the heel is of a rich, sooty black, well distinguished from the rusty on the sides. This is also the case in less degree with the fore foot. In 245 there is only a trace of this sooty tint. The ears seem considerably higher and more acute. There is much more black on the inside face of the ear; the grayish white patch, instead of reaching almost to the anterior edge, scarcely invades the anterior half of the ear.

In some other specimens from California the characteristics are more like those given for the Atlantic species. The fur is softer, grayer, and the dark color of the back less distinct. These were probably all killed in fall or winter.

A skin of a wild cat from Florida, borrowed for examination from Mr. Savery, in some respects differ from any other I have had an opportunity of examining. Its most conspicuous characters are the gray color, prevalent on the upper parts and sides, to the exclusion of any rufous tinge whatever, and the great distinctness of the lines of black on the back and head, and of the dark spots on the outside of the limbs. There is a considerable mixture of black hairs with the gray of the dorsal surface distributed uniformly; but on the back are two or three black longitudinal stripes, mostly continuous, but occasionally interrupted, and extending from the shoulders to the root of the tail. There are no stripes on the neck, but those on the top of the head, four in number, are very distinct, as also are those on the cheeks, and the four through the line of whiskers. The terminal third of the tail is black above; anterior to this are three half rings of black; the under surface and centre of the extreme tip are white. The extero-anterior surface of the fore and hind legs are thickly crowded with distinct and clear black blotches, which are smaller on the feet than on the legs. The inside of the arms and thighs is very distinctly banded. The spots on the belly are also very conspicuous.

This pattern of coloration is found in other specimens of wild cat before me, in which, however, owing to the lighter and more rufous color of the spots of the legs, and the redder fur, they are less conspicuous. I see nothing, however, to warrant the separation of this variety as a species, as was done by Rafinesque; but, upon the whole, I am not sure that this specimen is not as well entitled as the Texan lynx to distinct rank as a variety. In this case it would bear the name of *Lynx rufus* var. *floridanus*, Rafinesque. The tail is rather long, measuring six inches to the end of the hairs.

In the study of the North American lynxes, although a considerable number of specimens has been before me, I have found it difficult to come to satisfactory conclusions, owing to the imperfect condition of some and the uncertainty as to date of collecting of others. It is well known that this species, having a very wide range, varies much, not only with locality and season, but those from different localities will vary much at the same time. Northern skins of wild cats have generally longer and softer hair the year through than the southern, while, as in the deer, the hair will have a reddish or bay tinge, which is replaced by a grayish in winter.

In many of our animals of wide distribution, there appear to be several races, as far as dimensions are concerned, in particular species; skulls of the same relative age being different in size. This is particularly the case in the cats, racoons, bears, and deer, and, as a general rule, the further south we go, the smaller the species. This condition of things adds not a little to the confusion which prevails. The skulls vary much too with age, and probably also with sex, although the specimens before me not having the sex indicated do not afford the clue to the peculiarities of male or female.

There appear to be at least three species of smaller American lynxes in North America—the common Bay Lynx, which reaches from the Atlantic to the Pacific, throughout nearly the whole latitude of the United States, but is replaced in Texas and southern California by the *Lynx maculatus*, and in northern Oregon and Washington Territory by the *L. fasciatus*. The precise limits of these last mentioned species, other than as indicated, has not yet been ascertained.

The examination of a large number of well prepared specimens of different ages, sexes, seasons and localities, will, however, be necessary fully to unravel the perplexities which now encompass the whole subject.

Measurements.

	1588.	1167.
Length of head and body.....	28 $\frac{3}{4}$	27
Tail	7	-----
Heel to end of hind foot.....		6 $\frac{1}{2}$
Height at shoulder		15 $\frac{1}{2}$

List of specimens.

Catalog's number.	Correspond'g No. of skulls.	Age & sex.	Locality.	When collected.	Whence obtained.	Nature of specimen	Collected by
1027		-----	Carlisle, Pa	-----	S. F. Baird.....	Skin.....	-----
2042	3087	-----	Rowleysburg, Va.	-----	A. Brakeley	do.....	-----
1557		-----	do.....	-----	do.....	-----	-----
245		-----	Selma, Ala.....	-----	Prof. A. Winchell.....	-----	-----
1630		-----	St. John's river, Fla ..	-----	W. Savery	-----	-----
? 1165		-----	Brazos river, Texas ..	-----	Capt. R. B. Marcy ..	-----	-----
? 1649		-----	Fort Chadbourne, Texas	-----	Dr. E. Swift.....	-----	-----
1824		-----	Fort Pierre, Neb.....	-----	Lt. G. K. Warren.....	-----	Dr.F.V.Hayden.
1845		-----	Great Bend of Missouri	Oct. 10, 1856	do.....	-----	do.....
1846		-----	do.....	do.....	do.....	-----	do.....
1844	2883	-----	Mouth of Big Sioux ..	Oct. 28, 1856	do.....	-----	do.....
? 1588		♀	San Diego, Cal.....	Feb. 2, 1856	Dr. J. F. Hammond...	-----	-----
1589		-----	do.....	do.....	do.....	-----	-----
1167		-----	Santa Clara, Cal	Nov. 1855	Dr. J. G. Cooper.....	-----	-----
1209		-----	Presidio, near San Francisco.	-----	Lt. W. P. Trowbridge	-----	-----
560	1876	♀	Bodega, Cal.....	-----	do.....	-----	T. A. Szabo....
169		-----	Oregon	-----	Dr. J. Evans.....	-----	-----
1385		-----	Plum Spring, Iowa.....	-----	B. F. Odell	-----	-----

LYNX RUFUS, var. MACULATUS.

Texas Wild Cat.

Felis maculata, HORSFIELD & VIGORS, Zool. Jour. IV, Oct. 1828, Jan. 1829, 381; pl. xiii. (Mexico.)

Lynx rufus var. *maculatus*, AND. & BACH. N. A. Quad. II, 1851, 293; pl. xcii.

? *Felis rufa*, GEOFFR. Voy. Venus, Zool. I, 1855, 150; pl. ix. (Monterey, Cal.)

SP. CH.—Fur short and rather coarse. Color above and on the sides, light reddish-brown, overlaid with grayish in the winter. Quite distinct spots of darker on the back and sides. Collar on the throat paler than sides. Beneath, white, spotted. Inside of legs banded. Tail with a small black patch at the end above. Inner surface of ear black, with a white patch.

In the examination of this species I have been greatly aided by a large series of skulls belonging to the Berlandier collection of Lieut. Couch, showing the species in almost every gradation of growth, from very young to extreme age. As a general rule these skulls are much narrower and more elongated, the cranium of less capacity, and the outline of the zygoma, as viewed from above, considerably straighter and more parallel with the axis of the skull than in the other species. The species itself appears to be actually larger than the others, (not including *L. canadensis*.)

Unfortunately, the series of skins is much less complete and does not afford indications as satisfactory as the skulls. There is enough, however, to show a redder color in summer, with spots more or less distinct always discernable on the back and sides, shorter hair and a longer tail.

The typical specimens from the Rio Grande, all appear strongly marked. Those from Northern Texas are less manageable, while in specimens brought from the Gila, at Camp Yuma, by Mr. Schott, there are certain difficulties in assigning either this or the *L. rufus* as the true species. Whether any other kinds of *Lynx* may be in question here, I am not now prepared to say. I will, for the present, retain these specimens under *L. maculatus*.

Description of No. 132, from El Paso.—The fur of this specimen is very short, not more than three-quarters of an inch on the back and sides; rather longer on the belly; the hair is very coarse and thin. The general color above is a chestnut-brown, darkest on the vertebral region. This prevalent tint, however, is imparted by a large number of crowded rounded spots, between which the ground color is lighter. There is also a slight sprinkling of black, especially in the darker chestnut of the median line, produced by subterminal annulations of the coarse hairs. The dark spots may be distinctly made out over the whole superior and lateral surfaces of the body and limbs, largest on the flanks. The under parts are rather white, with large spots of black. On the inside of the thighs the black markings assume the condition of five or six transverse narrow fasciae, continuous, with rows of dark-chestnut dots in the lighter chestnut of the side of the body; one or two broad fasciae may be seen on the inside of the fore leg.

In many parts of the superior portions, particularly on the outside of the thighs and shoulders, the dark-chestnut spots are seen to arrange themselves in rather oblique series.

The tail is white beneath and at the extreme end. The upper portion of the tip of the tail is black, in a patch not more than three-quarters of an inch square. Behind this is a mixture of brown, gray, and rusty, passing gradually into the chestnut of the back. The ears are black; the central portion occupied by a grayish-white patch.

This specimen was probably taken in summer, as shown by the extreme thinness of the hair and the bright color. It is only a hunter's skin, and does not admit of being fully described.

In another specimen, (123,) probably caught in winter, the hair is longer and softer, but still quite thin. Above, it is of a rusty-gray, with a hoary cast, produced by grayish-white tips to the long hairs. The specimen, though in a bad condition, exhibits a decided indication of longitudinal dusky narrow lines. There is little trace of spots, although these can be made out occasionally. The tail exhibits two or three dusky bars in advance of the usual black at the tip. There are two black lines diverging from a point on the chin, connecting with an elongated patch of the same color occupying most of the ruff.

Measurements, (No. 123.)

	Feet.	Inches.
To root of tail.....	3	
Tail, vertebræ.....		5 $\frac{1}{4}$
Tail to end of hairs.....		6 $\frac{1}{2}$
Skull, length.....		5 $\frac{1}{12}$
Skull, width.....		3 $\frac{6}{12}$

In a specimen (1164) referable to this species, from Fort Belknap, there are numerous black or dark-brown spots (the hairs black to the roots) on the back, which posteriorly assume the character of narrow lines. The black at the end of the tail above is about three-quarters of an inch square.

In a young kitten of *L. maculatus* in alcohol, (2292,) from Matamoras, the ground color is of a yellowish-white, with many decided spots of black—most sparse and largest beneath. The ears outside are black, with a white patch. There is no black on the side of the lip, although four narrow lines through the roots of the whiskers are readily discernable.

Measurements.

	Inches.
Head and body to root of tail.....	9
Tail including hairs.....	3 $\frac{1}{4}$

As already mentioned, a specimen from Camp Yuma (No. 789) differs in many points, although in the distinct spots it is most related to *L. maculatus*.

The prevailing color above of this specimen is light rufous, much obscured with light gray and black. There are numerous, rather large spots of more decided rufous interspersed on the back and sides, as also on the exterior of the limbs. Beneath, the animal is pure white, with black blotches.

There is a hoary tinge about the head owing to the white tips of many hairs. The extreme margin of the orbits is black, including the naked edges of the eyelids; the greater portion of the eyelids, however, above and below this, is white; this color in two crescentic patches on either eyelid, which are not continuous. On each side the muzzle are four narrow lines of black parallel with the edge of the mouth and reaching beneath the eye; these indicate the lines of whiskers, and above there is a fifth line proceeding backwards from the outer edge of the nostril.

The edges of the lips are black. On the top of the head are several indistinct longitudinal lines of dusky-brown.

The interior of the ear is uniform grayish-white. The exterior surface exhibits a narrow border (the edge of the ear) of rufous white, within which the surface is lustrous black, with a triangular patch occupying the central portion, of grayish-white. The lustrous black is most distinct anteriorly and at the point of the ear; posteriorly and inferiorly, it is much duller and tinged with grayish-brown. The black at the tip of the ear is continuous into a pencil of hairs about half an inch long.

The upper parts and sides of the body are of a light rufous, tinged with hoary, exhibiting, however, a considerable number of obscure rounded spots as large as the end of the finger, of a darker and more distinct rusty than elsewhere. This color belongs chiefly to the soft wool between the long hairs; this is pale lead color at the base, and darker or lighter rufous, as the spots fall in it or not. The tips are generally more or less hoary. There are also intermixed a good many hairs with black tips, which, concentrating along the vertebral region, become quite conspicuous, and impart the appearance of indistinct longitudinal lines, as they happen to fall together.

The exterior of the limbs much resembles the sides of the body, except that the color is a little more rufous, and the spots are smaller, darker, and more distinct. The hairs on the under surface of the feet are dark plumbeous-brown, this color extending up the leg for a short distance. The under parts and inside of the limbs is pure white, with sooty black blotches, this color extending to the roots of the hairs, which are elsewhere lead color. On the upper part of the insides of the limbs are some larger blotches than elsewhere, which on the hind leg, however, do not convey the idea of transverse bars.

The anal region and under surface of the tail, with its extreme tip, are white. The extremity of the tail exhibits a quadrangular patch of pure black, about one-half to one-third longer than wide, (one and a half inches long,) and there is a second narrow transverse dusky (not black) bar, a little anterior to the first. Very obscure indications of other transverse bars may be seen between this and the root of the tail. The upper part of the tail generally, except as described, is like the sides of the body.

In addition to the markings described, there is an obscure dark line along the sides of the neck, starting below the ear, and two rounded black spots between the anterior extremities of these lines, which diverge slightly from each other.

The ears of this species are quite large and pointed. The naked portions of the soles are quite limited. There are seven naked pads on the fore feet and five behind.

A second specimen from the Gila (1338) and one from Dona Aña, (1709,) agree also with the above description.

Measurements.

	Inches.
Length (corrugated skin) from nose to root of tail...	28
Tail to end of vertebræ.....	4½
Tail to end of hairs.....	5½
Skull, length.....	4½
Skull, width.....	3½

The specimen of *Lynx* (710) collected by Dr. Heermann at Tejon valley, agrees very well with skins of *L. maculatus* from the Rio Grande of Texas. The prevailing color is pale reddish, the tips of the hairs of a yellowish gray. The dorsal region is rather darker, and exhibits some faint longitudinal dark lines. Scattered over the whole outer surface are numerous rounded spots or blotches of darker rufous, which, though not very conspicuous, are distinctly visible. The spots are darker and more mixed with brown on the legs; the under and inner surfaces are white; a faint reddish collar on the throat, in advance of the fore legs. The belly is blotched, and the inside of the legs banded transversely with black. The chin is unspotted. There are the usual markings on the head. The ears are black inside, with a moderately large patch of grayish white; they are distinctly pencilled. The tail above is like the back, with several darker bands; the terminal fifth, however, is black.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by
2292	-----	○	Matamoras, Mexico	-----	Lt. D. N. Couch	In alcohol.	Dr. L. Berlandier.
123	1109	-----	Eagle Pass, Texas	April, 1852	Major W. H. Emory.	Skin.....	A. Schott.....
132	-----	-----	El Paso, Texas	-----	Col. J. D. Graham	do.....	Chas Wright
1709	-----	-----	Dona Ana, N. M.	Nov. 13, '55	Capt. J. Pope	do.....	-----
710	-----	-----	Tejon valley	-----	Lt. R. S. Williamson.	do.....	Dr. A. L. Heermann.
1338	-----	-----	Fort Yuma, Cal.	-----	Major W. H. Emory.	do.....	A. Schott.....
789	2051	-----	do	-----	do	do	do

LYNX FASCIATUS, Raf.

Red Cat.

Lynx fasciatus, RAF. Am. Month. Mag. II, Nov. 1817, 46.

DESM. Man. Mamm. I, 1820, 225.

Felis fasciata, HARLAN, F. Am. 1825, 100.

RICH. F. B. A. I, 1829, 104.

Felis rufa, RICH. F. B. A. I, 1829, 103.

Tiger cat, LEWIS & CLARK, Travels, II, 1814, 167.

SP. CH.—Fur very soft and full. Ears pencilled. Color, rich chestnut brown on the back, a little paler on the sides and on the throat. A dorsal darker band collar on throat, as dark as the sides. Region along central line of belly, (rather narrow one,) dull whitish, with dusky spots extending to lower part of sides. No spots or bands discernible on the upper part of sides. Ears black inside, with a very inconspicuous patch of greyish. Terminal third of tail above, black.

(1166.)—This species is remarkable for the softness and fullness of its fur, in this respect coming closer to the *Lynx canadensis* than any of the small species. The same characteristic applies to the tail, which is very full and thick, rather longer than in *L. rufus*.

The prevailing color of the specimen is a rather dark and rich chestnut, very sparsely grizzled with reddish gray. Along the dorsal region, especially in its middle portion, is a darker and broad band of black, mixed, however, with the reddish gray already referred to. There is comparatively little difference in the color of the neck all round, the throat from the ruff to between

the fore legs being chestnut, varied, however, with the large dusky spots visible on the whole lower surface. The chestnut of the sides extends far on the belly, which, instead of being a pure sharp white, is much tinged in places with pale yellowish brown, no part being clear white. The dark blotches are quite distinct on the lower part of the sides, though none are distinguishable on the upper part of sides and back.

The exterior of the limbs is like the sides of the body, though more distinctly blotched with dusky. The interior faces are like the middle of the belly, with three distinct transverse bars on the fore leg, and traces of a fourth near the wrist; the inside of the thigh being similarly marked. The elevated sole to the heel on the hind feet, with the regions around the pads of all the feet, are very distinct sooty brown.

The ears, at first sight, appear entirely black; a closer inspection, however, reveals an obscure small patch of grayish near the posterior margin, much less than in other small lynxes. The ears are slightly pencilled. There is a considerable amount of black about the head, the edge of the jaws being decidedly so. There is a dark line in the ruff, from behind the angle of the jaw, obliquely downward and inward, running into a patch of the same in the thickest of the ruff; another extends from a point in the centre of the chin, (those of opposite sides starting together and diverging backwards,) and running into the same patch on the ruff.

The tail exhibits but little white beneath. The centre of the extreme tip, however, is dull white. The upper part is like the back, with one or two transverse dusky bars, and the terminal third is black; this covering a larger proportion of the tail than in any other of our species.

The black of the back does not penetrate far towards the roots of the hair, except in a few which are black to near the base.

Several other specimens from Washington Territory agree in general characters, as color, length, and softness of hair, &c. They have a rather more conspicuous gray patch on the ear, though less than in other lynxes. These are all fall or winter specimens apparently. They lack the very decided dorsal dark stripe of 1166, though this region shows a greater predominance of dark hairs than elsewhere. One specimen (1024) has quite a grayish cast, though the reddish tint is more appreciable than in the *L. rufus*.

Owing to the condition of the skins, nothing satisfactory can be presented respecting the comparative measurements, excepting with regard to No. 464, which was measured before skinning by Dr. Cooper, who gives—length, 34 inches; fore leg, 18; hind leg, 20; tail, 6; iris yellow.

A skull, No. 3147, is considerably larger than that of any wild cat I have ever seen, fully attaining the dimensions of the skull of a Canada lynx. (Length, 5.38; width, 3.85.)

This species is readily distinguishable, by its rich chestnut color and full soft fur, from the other American lynxes; the Texas one being paler, and hair much shorter. The light colored region of the belly is narrower than usual, the chestnut of opposite sides sometimes seeming to come almost into contact. In no other is the band across the throat so continuous and so near the color of the sides; the black margin to the upper lip is broader. The ears, too, have much less of a gray patch than usual; one specimen, indeed, exhibits scarcely a trace of this.

This handsome lynx was first described by Lewis & Clark in the narrative of the expedition up the Missouri; and, in point of minute accuracy, their notice leaves little to be desired. This is as follows:

"The tiger cat inhabits the border of the plains and the woody country in the neighborhood of the Pacific. The animal is of a size larger than the wild cat of our country, and much the same in form, agility, and ferocity. The color of the back, neck, and sides is of a reddish

brown, irregularly variegated with small spots of dark brown; the tail is about two inches long, and nearly white, except the extremity, which is black. It terminates abruptly, as if it had been amputated; the belly is white, and beautifully variegated with small black spots; the legs are of the same color with the sides, and the back is marked transversely with black stripes; the ears are black on the outside, covered with fine short hair, except at the upper point, which is furnished with a pencil of hair, fine, straight, and black, three-fourths of an inch in length. The hair of this animal is long and fine, far exceeding that of the wild cat of the United States, but inferior in that quality to that of the bear of the northwest. The skin of this animal is in great demand amongst the natives, for of this they form their robes, and it requires four to make up the complement."

In the description of color, character of fur, &c., this account agrees very closely with specimens before me, except that the spots of dark brown above are but slightly conspicuous. Several specimens have one or both ears entirely black, as stated, and in all the usual white patch is quite inconspicuous. The alleged shortness of the tail is easily accounted for by its contraction or twisting in the skin examined by the authors. The greatest discrepancy exists in the remark that "the back is marked transversely with black stripes." In the connexion of the paragraph it is very evident that the back or inner sides of the legs is understood, (which are so striped,) as the back or upper surface of the body had already been described as reddish brown, irregularly varied with small spots of dark brown, (not striped transversely with black.)

The name of *Rafinesque* was given under the impression that the back was striped transversely, whence the name of *fasciatus*. As the term really applies to a part of the body, even though the character is shared by most species of *Lynx*, it is best to retain it, and thus expunge a synonym. *Rafinesque* himself never saw a specimen, but based his name on the description quoted above.

The *Felis rufa* of Richardson applies very well to this species, and is probably identical with it. This author gives also *Felis fasciata*, from the description of Lewis & Clark, and sees a close resemblance between the two; interrupted, however, by the supposed transverse dorsal stripes of the latter. As shown above, however, Lewis & Clark clearly referred to transverse stripes on the back part of the leg, and not on the dorsal surface of the body.

No specimens have thus far been received, except from the western portion of Washington Territory.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex & Age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n.	Collected by
2004	3126	♂	Fort Steilacoom, W. T.	-----	Dr. Geo. Suckley...	114	Skin	-----
1946	-----	-----	do	-----	do	97	-----	-----
1947	-----	-----	do	April, 1856	do	87	-----	-----
1024	-----	-----	do	1854	do	63	-----	-----
660	1877	-----	do	-----	Gov. I. I. Stevens.	19	-----	Dr. Geo. Suckley.
2385	3147	-----	Port Townsend, W. T.	-----	Dr. Geo. Suckley	134	-----	-----
2386	-----	-----	Olympia, W. T.	-----	do	-----	-----	-----
1166	-----	-----	Shoalwater Bay, W. T.	-----	Dr. J. S. Newberry.	-----	-----	Dr. J. G. Cooper.
461	-----	-----	do	Sept. 26, '54	Dr. J. G. Cooper...	20	-----	-----

LYNX CANADENSIS.

Canada Lynx.

Felis canadensis, ("Geoff. Par. Mus.") DESM. Mam. I, 1820, 224.

"SABINE, Franklin's Jour. 659."

HARLAN, F. Am. 1825, 98.

GODMAN, Am. N. H. I, 302.

SMITH, in Griff. Cuv. V, 1827, 174.

RICH. F. B. A. I, 1829, 101.

Lynx canadensis, RAF. Am. Month. Mag. II, Nov. 1817, 46.

AUD. & BACH., N. A. Quad. I, 1849, 136; pl. xvi.

Felis borealis, TEMM. Mon. Mam. I, 1827, 109.

WAGNER, Suppl. Schreber, II, 1841, 519.

Lynx borealis, DEKAY, N. Y. Zool. I, 1842, 50; pl. x, f. 2.

SP. CH.—Size, that of a setter dog. Tail as short or shorter than the head; its terminal fifth above and extreme end black all round. Feet very large, densely furred beneath in winter, so as to conceal the pads. Hind feet about 9 inches long. General color, grayish hoary, with concealed pale rufous, and waved with black, especially on the back. No distinct transverse band inside the legs; very obsolete dark markings on the head; ears with a narrow black margin on the convexity, and black pencil; grayish elsewhere. Whiskers chiefly white.

This species, the largest of the North American lynxes, is readily distinguished from the others, not only by its size, but by the proportionally longer hair and larger feet, independently of the differences of coloration, &c., which will hereafter be referred to. It is apparently as large as a medium sized setter dog, although the weight is considerably less. The head is broad and the facial outline much arched. The neck is full and thick, with a pointed ruff at each side. The legs are thick, and the paws enormously large. At first sight, the under surface of the paws appears entirely covered with dense hair; but on carefully separating this, the naked pads are found in the same number as in the other lynxes, but of smaller size, both absolutely and comparatively, (seven on the fore paws and five on the hinder). The pads on the palms and soles are more readily detected than the rest. The tail is very short and densely hairy; the ears are angular above and tipped with a pencil of very long hairs. As far as can be judged from the rather imperfect specimen, the whiskers are in three horizontal series.

The prevailing color of this animal is gray, varied somewhat with pale rufous, and with a general wash of black on the back and sides, formed by the dark tips to the hairs. The dorsal region shows little, if any, rufous. Although there is no distinct pattern in the distribution and intensity of the black tips to the hairs, yet there may be traced some obscure indications of blotches and waved lines, which after all, however, may be owing to accidental conditions of arrangement in the hair, which is very long and loose. The soft under hairs are all leaden grayish for the basal half, the terminal portion on the sides of the body passing into pale rufous; on the dorsal region it becomes more dusky. The gray and black markings described are entirely in the long straight hairs, thickly interspersed in the other sort. The inferior and anterior portions of the body and limbs are dirty white, with obscure blotches of brown, and the distinct black bands of the other American species are either wanting or very faintly represented. The exterior surfaces of the limbs are pale rufous, with the hairs gray, the latter color predominating on the fore legs. The soles are dull rusty white.

There are few markings visible on the head, which is grayish, with black tips to the hairs.

There are dusky lines through the rows of whiskers, and the anterior canthus of the eye is dusky. The whiskers are principally white, a few black. There are several patches or tufts of black in the ruff on each side of the throat. The concavity and anterior margin of the ear are grayish; the convexity shows anteriorly a border of black, which, however, rapidly passes behind into grayish white; the black is narrower and much less distinct than in the smaller lynxes. The pencils of hairs on the ears are black, and from two to three inches long. The chin and throat are immaculate and grayish white. The extreme tip of the tail is black, the color extending further on the upper than on the lower surface, (over about one-fourth or fifth in the former.) The remaining part of the dorsal surface and sides is rufous, with some grayish tips; the under surface is yellowish white, although this color is restricted to very narrow limits. Its shape is quite cylindrical.

This lynx in many characteristics differs from all others in the United States, although coming nearer to the *Lynx rufus* than to any other. It is, however, much larger and the fur fuller. The feet are much larger. The soles of the feet are densely furred, concealing the pads instead of leaving them exposed. The transverse bands inside of the fore legs are wanting. The ear has a much larger grayish spot on its convexity, and the pencils at the tip are longer. The markings on the sides of the face are very inconspicuous. The tail is black at the very extremity, instead of having a narrow vertical patch of white extend up from the lower portion between the black. There are none of the transverse dusky bars on the upper surface of the tail. (No. 77.)

Since the preceding description was written, a second specimen has been received by the Smithsonian Institution, among the rich collections made by Mr. W. S. Wood, in Lieutenant F. T. Bryan's party. This is the more important, as being in summer pelage, a condition which differs considerably from that of winter. The most striking feature is the much shorter and less dense fur all over the body, the longest on the back measuring little over $1\frac{1}{2}$ inches. The prevailing colors, however, are much the same, with less gray and rather more rufous. No bands or spots are visible on the hind leg; on the inside of the fore leg, however, two or three dusky blotches are to be seen. The black margin of the ears is rather more conspicuous, owing to the shortness of the gray central fur; the black pencils tipping the ears are about two inches long.

The pads on the feet in this specimen are distinctly visible, not being at all overgrown, as in winter specimens; as stated above, they are considerably smaller than in the small American lynxes.

	Inches.
Head ¹	$6\frac{7}{8}$
Head and body	$34\frac{1}{2}$
Tail, vertebrae	$4\frac{1}{2}$
Tail, hairs	$5\frac{3}{4}$
Hind foot	9

The Canada lynx is readily distinguishable by the above characteristics from the smaller lynxes of Europe and America; but its relationships with the large species from northern

¹ Measurements taken before skinning

Europe are more difficult to ascertain from want of specimens for comparison. The less amount of black at the end of the tail distinguishes it from *Felis lynx* and *cervaria* of Europe, in which the terminal half of the tail is black, and where also the tail itself is longer than the head, and the fur showing distinct dots or blotches on the ground color; in this quite different from the Canada lynx. These species, too, appear to have uncovered pads on the soles, with the *Lynx* or *Felis borealis*; however, the precise amount of relationship is by no means clear. The *F. borealis* of Thunberg is considered by Nilsson and Wagner as identical with *cervaria*, while Keyserling and Blasius retain *F. borealis* as distinct, and characterize it as much like our Canada lynx, except that the whiskers are stated to be black.

European authors do not, however, seem agreed, on the whole, that there is a European species corresponding with the Canada lynx, and although Temminck, in describing the latter as *F. borealis*, says it is found on both continents, yet Wagner evidently hesitates to follow him in extending its range to Europe. While, therefore, the Canada lynx may occur in Europe, or one similar to it, on the other hand, what is called *Felis borealis*, may be, as stated by Nilsson and others, only a highly developed *Felis cervaria*.—See Keyserling & Blasius, Wirbelthiere Europas, and Nilsson's Skandinavisk Fauna, I, 1847, 125, &c.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
77	-----	-----	Fort Union, Nebraska-----	Winter, 1850	A. Culbertson-----	-----	Skin-----
1872	2570	♂	Main Fork, Medicine Bow river, Nebraska.	Aug. 6, 1856	Lt. F. T. Bryan; collected by W. S. Wood	217	do-----

FAMILY.

CANIDAE.

FAM. CH.—Digitigrade carnivora without retractile claws. Feet apparently all four-toed, the foremost ones, however, with a rudimentary thumb high up, to which a claw is attached, (sometimes wanting.) Molars $\frac{6-6}{7-7}$, or more.

Of that family of the Carnivora which immediately succeeds the *Felidae*, namely, the *Hyaenidae*, North America has no representatives. In general appearance the hyenas resemble the dogs most closely—like them, having blunt and non-retractile claws, with the anterior feet really four-toed. In this respect they differ from both the cats and dogs, and agree with them in being digitigrade. The dentition in number and shape of teeth is intermediate between the two, the formula being—incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{3-3}$; molars, $\frac{1-1}{1-1}=34$. There is but one tubercular molar above behind the sectorial, and none below. The numerical difference in dental formula between the hyenas and cats is in the existence, in the former, of an additional premolar on each side of each jaw.

The family of dogs is equally well marked with that of the cats, and like it, is distributed all over the surface of the globe. Indigenous species occur in all habitable latitudes, and the domestic dog lives and thrives wherever man has obtained a foothold.

The dogs in many respects resemble the hyenas more than the cats—like the former, being without retractile claws. The teeth are, however, more numerous, the normal formula consisting of—incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{2-2}{3-3}=42$. In one group, however, *Megalotis*, (*Agrodus* of Ham. Smith,) there is a still greater number of teeth, in the addition of two true molars above, and one below on each side of the jaw.

In size the *Canidae* vary considerably, from the largest wolves to the small Fennec, (*Canis zerda* of authors.) This, however, is scarcely exceeded by the diminutive *Vulpes littoralis* of the coast of California, which is hardly larger than a house-cat.

The chief characteristics of the teeth of the *Canidae*, as summed up by Owen, are as follows: The incisors are in a series forming the segment of a circle, and increase progressively in size from the first to the third or outer one; the trenchant margin of the crown is divided by two notches into a large middle and two lateral lobes, the inner lobe being obsolete in the external incisor. The premolars have strong sub-compressed conical crowns, gradually enlarging posteriorly and acquiring one or two accessory posterior lobes with the increase in size. The fourth upper premolar is the sectorial tooth, and is much larger than the one anterior to it; its blade is divided into two cones by a wide notch, the anterior cone being strongest and most produced. The tubercle is developed from the inner side of the base of this lobe. The first and second upper molars are tuberculate, each supports two external cusps and a broad internal basal sub-tuberculate talon; the second molar is less than half the size of the first. The first true molar below is the sectorial one; the blade is divided by a vertical linear fissure into two cones, the posterior the largest; behind this the base of the crown extends into a broad quadrate tuberculate talon. The second molar has two anterior cusps on the same transverse line, and a posterior broad flat talon; the last lower molar is the smallest of all the teeth.

The incisors, canines, and first premolars, have each a single fang; the second and third premolars above, and all premolars and molars below, have two fangs, except the last lower molar, which has but one; the upper sectorial or fourth premolar and the last upper true molar, have three fangs; the first upper true molar has four fangs.

The deciduous dentition of the Canidae is, incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{3-3}{3-3} = 28$.

The chief external peculiarities of the dogs, as distinguished from the cats, are to be found in the long sharp muzzle, pointed erect ears, small eyes, long hair, bushy tail, contracted belly, &c.

The entire family of the *Canidae* is divisible into several groups, all of the same dental formula, exclusive of the aberrant genus *Megalotis* or *Otocyon*, in which there are six additional teeth, as described. These groups may be characterized as those of the wolves and foxes, although the South American foxes, in reality, form a group directly intermediate between the wolf and fox forms of Europe and North America—a fox-like wolf.

In the wolves the pupil is circular, the tail rather short, and the median upper incisors very distinctly lobed on each side. In the foxes the pupil is elliptical, the tail long and bushy, and the whole form more slender. But the most appreciable difference is to be found in the character of the post-orbital process of the frontal bone, as indicated by Burmeister. This process in the wolves is triangular and decidedly convex on its upper surface, rounding outwards and downwards, with the point appreciably below the plane of the interorbital space. In the foxes, however, this process is scarcely convex above, sometimes concave, the point hardly dips down at all, the margins particularly, the anterior of which are slightly turned up, and there is a conspicuous depression or indentation along the base of this process above, where it springs from the frontal bone. It is an interesting fact, that all the fox-like animals of South America have really the wolf type of structure, not only in this respect, but in having nearly circular pupils. Their tails are, however, very long, exceeding even those of the true foxes, and reaching to the ground; and the name of *Lycalopex*,¹ as proposed by Burmeister, seems quite appropriate. To the wolves, probably embracing all the South American *Canidae*, we may assign the name of *Lupinae*, the *Vulpinae* including all the true foxes.

Since the preceding paragraph was written, Burmeister has subdivided the South American fox-like wolves into *Lycalopex* and *Pseudalopex*.

SUB-FAMILY LUPINAE.

Post-orbital process of the frontal bone very convex and curving downwards, with little or no depression or indentation in its upper surface.

¹ *Cerdocyon* of Hamilton Smith, *Dogs*, I, 1839, 289.

CANIS, Linn.

Canis, LINN. "Systema Naturae I, 1735."

The generic character of *Canis* may be said to be contained chiefly in the preceding diagnosis of the sub-family. If, however, we really separate the fox-like wolves of South America, or *Lycalopex* and *Pseudalopex*, Burmeister, we may add, pupil entirely circular, size large, tail rather short, in distinction from the smaller size, long tail, slender muzzle, and pupil varying from round to elliptical.

I do not now propose to go into any extensive examination of the skulls of the American wolves, as the materials before me are not sufficient to furnish any satisfactory conclusions. I may simply state, however, that they constitute at least two very well marked sections, whether these contain more than one species each or not. In the one, the skull is slender and the muzzle long and pointed, as in the foxes. The cranium proper is always more convex, and the temporal or sagittal crests are never so prominent. The height of the skull is less than the width of the cranium at the temples. To this section belong the prairie and coyote wolves, all of a size about equal to that of a pointer dog. The other wolves are much larger; the skull is as high as it is broad between the temples; the cranium proper is less convex, the temporal or sagittal crest much higher and extending further forwards. The muzzle is broader and less pointed. The orbits are smaller in proportion. To this group belong the white, gray, red, black, buffalo, and other supposed species or varieties of large wolves.

Attention has already been called to the resemblance which the South American foxes bear to the wolves, especially in the character of the post-orbital processes of the frontal bone. A skull of *Canis* (*Pseudalopex*) *magellanicus*, (1150,) from Chile, now before me, is as long as that of a prairie wolf (*C. latrans*, No. 818). It is, however, much lower, the upper outline more nearly straight; the cranium proper much less in size as well as less convex. The muzzle is longer, the portion behind the glenoid cavity shorter. The post-orbital processes are further forward, owing to the smaller size of the orbits. The processes exhibit a little grooving, although this is barely appreciable; their upper surface, however, is bent rapidly downwards, as in the wolves, producing a great convexity. The zygoma is much narrower, but longer and less arched. The palato-maxillary suture runs forward to a truncated acute angle, which extends nearly to opposite the middle of the third premolar, instead of only to the anterior extremity of the fourth. The teeth are all much smaller, except the canines, which are appreciably longer. The coronoid process is triangular in outline, with a blunt or rounded apex.

CANIS OCCIDENTALIS, var. GRISEO-ALBUS.

"*Canis* (*Lupus*) *griseus*, SABINE, in Franklin's Journal, 654." (Gray.)

AUD. & BACH. N. A. Quad. III, 1854, 279. (Gray.)

Canis (*Lupus*) *occidentalis*, var. *griseus*, RICH. F. B. A. I, 1829, 66. (Gray.)

Canis occidentalis, DEKAY, N. Y. Zool. I, 1842, 42; pl. xxvii, f. 2. (Gray.)

"*Canis* (*Lupus*) *albus*, SABINE, in Franklin's Jour. 652." (White.)

AUD. & BACH. N. A. Quad. II, 1851, 136; pl. lxxii. (White.)

var. β , RICH. F. B. A. I, 1829, 68. (White.)

Canis variabilis, MAXIM. Reise in das innere Nord-Amerika, II, 1841, 95. (White and gray.)

? *Lupus gigas*, TOWNSEND, Jour. Acad. N. Sc. Ph. (N. S.) II, Nov. 1850, 75. (Oregon.)

CH.—Color, pure white to grizzled gray.

In the lack of perfect specimens of the North American wolf, I find it very difficult to throw any light upon the long vexed question of our species, all before me being mutilated in some way, and not allowing a satisfactory comparison with each other and with descriptions. Naturalists are divided in opinion as to the differences in American wolves, some insisting that the supposed peculiarities of American specimens disappear when those of corresponding localities in the two worlds are compared, and others suggesting that permanent differences are those of race merely. The theory of absolute differences in the species is supported by the smaller number of writers. Richardson, whose opportunities for investigation have been very ample, and who is surpassed by no one in the accuracy and weight of his examination of questions in zoology gives the following general summary of the subject:

“The American wolf of the northern districts is covered with long and comparatively fine fur, mixed with a large quantity of shorter woolly hair, and it has a more robust form than the European wolf. Its muzzle is thicker and more obtuse, its head larger and rounder, and there is a sensible depression at the union of the nose and forehead. Its more arched forehead is comparatively broad, the space between the ears being greater than their height. The ears are shorter, wider at the base, and more acute, and have, consequently, a more conical form, whilst the greater length of the hair, on the side of the neck of this wolf, makes them appear even shorter than they are. Its neck, covered with a bushy fur, appears short and thick. Its legs are rather short, its feet broad, with thick toes, and its tail is bushy, like the brush of a fox.

“The European wolf, on the contrary, has a coarser fur, with less of the soft wool intermixed with it. Its head is narrow, and tapers gradually to form the nose, which is produced on the same plane with the forehead. Its ears are higher, and somewhat nearer to each other; their length exceeds the distance between the auditory opening and the eye. Its loins are more slender, its legs longer, feet narrower, and its tail is more thinly clothed with fur.

“The shorter ears, broader forehead, and thicker muzzle of the American wolf, with the bushiness of the hair behind the cheek, give it a physiognomy more like the social visage of an Esquimaux dog, than the sneaking aspect of an European wolf. Buffon enumerates black, tawny gray, and white, as the colors exhibited by the fur of the European wolves. In the American northern wolves, the gray color predominates, and there is very little of the tawny hue. The general arrangement of the patch of color, is, however, nearly the same in both races.”

At the same time, however, he does not wish to be understood as asserting more than a permanent difference of race, leaving it to future comparison to determine whether the distinctions are specific or not. It must be remembered, however, that his experience of wolves was chiefly with the northern races, which, in the more severe climate, would naturally be more densely and finely furred than European animals of the more southern latitudes accessible to him.

It is difficult to occupy a middle ground between considering all our wolves as one species with many varieties, or making all these varieties into as many distinct species. Thus we have the pure white wolf of the Upper Missouri; the dusky blackish plumbeous wolf of the Missouri; the entirely black wolf of Florida and the southern States, and the entirely red or rufous wolf of Texas. These vary, too, in shape as well as color, the more southern ones appearing usually more slender, and standing higher on the legs, in consequence, perhaps, of

the comparative shortness and compactness of the fur. The more usual variety of color, perhaps, is the gray, which is found all over North America to the Arctic regions, the others being more local in their distribution.

The giant wolf of Townsend, as shown by the skull, is a wolf of enormous size, but whether it is more than a huge wolf of the old species, I do not venture to say. As shown by the table of measurements of skulls, however, it will be found surpassed in bulks by a Swedish specimen received from the Academy of Sciences of Stockholm, who also sent other skulls, equally marked with a strong median crest, but of less size. Until, therefore, the accumulation of specimens, by furnishing better means of comparison and determination shall indicate otherwise, I prefer to consider all the specimens before me as one species. Assuming that this is distinct from the European wolf, (not yet proved,) I shall employ Dr. Richardson's provisional name of *Canis occidentalis* for the species, and give the varieties as named by authors.

I have before me no skins at all from the upper Missouri, and consequently am unable to verify the description of Prince Maximilian, here subjoined to this article. A tolerably perfect specimen from Oregon (1014) has a soft fur of considerable fullness; the tail is bushy and large. The general color above is a yellowish gray, lightest on the back and shoulders. On the back and upper part of the sides is a considerable mixture of black points to the hairs; beneath, the colors are of a uniform yellowish gray, without any black on the chin or throat. The buccal membrane is black, but the hair around the mouth is whitish. There is very little black on the head; the muzzle is pale rusty. The tail above, is like the back; beneath, like the belly, but more brownish towards the end; the extreme tip is dark brown, with a few whitish hairs interspersed, as is usual in the wolves and foxes. The inside of the legs resembles the belly in color, the outside is similar, with light brownish points to the hairs, producing a muddled appearance. The anterior edge of the fore leg exhibits a slight indication of the usual wolf stripe. The ears are pale brownish yellow.

In this specimen much the longest hair is anteriorly between the shoulders. A short distance behind the shoulders, the dorsal hair is not much longer than on the sides. These hairs are about $4\frac{1}{2}$ inches long, white at the base, and then black, then white, and tipped again with black.

No. 1012 is much the largest in the collection. It agrees essentially with the one just described, except that the ears are more dusky, and the alternation of grayish white and black more distinct. There is no black visible on the throat or chin, nor any mark on the fore leg, as in most wolves.

No. 1011 is rather smaller than the preceding, and differs in the greater amount and intensity of the black on the ends of the hairs. In general appearance it presents a close resemblance to a specimen of *Canis mexicanus* of authors, from Sonora. There is a very considerable sprinkling of black on the head and neck, and the yellowish rusty of the ears exhibits a considerable number of black tips. There is also a slight tendency towards a black collar on the lower throat, the tips of a few hairs being black. This is much less so, however, than in the Sonora specimen referred to. It is impossible to say whether the chin is black, owing to the absence of the lower jaw. The hairs around the lips are, however, black. There is an indication of the dark wolf mark on the fore leg. The long hairs are beautifully variegated with white and black, the longest measuring $5\frac{1}{2}$ inches.

A large skin, No 1010, differs from the others in being generally of a darker cast, and the ends of the soft hairs rather more ferruginous, a tinge of which is also seen at the ends of

the white annulations on the long hairs. The ears, differing from any skins I have examined, are chestnut colored, with blackish tips to some of the hairs, and the margins strongly tinged with the same. The prevailing color of the muzzle and fore part of the head is black, with gray and brown hairs intermixed. The hair on the margin of the lips is not conspicuously darker, although there is a dusky shade in the chin and sides of the head, caused by occasional black tipped hairs. The hairs on the throat, too, have black tips and annulations, but there is no decidedly marked collar on the throat. There is a very conspicuous mark on the edge of the fore leg, extending from the shoulders to the carpus.

The skins of the wolves, as described above, all vary more or less, as will be seen from the description. One is without the stripe on the leg; the others exhibit it in a greater or less degree. No. 1010 has some of the characteristics given by Townsend as belonging to his giant wolf, though the size falls far short of his specimen. None have the black lower jaw, nor the very appreciable color of the specimen referred to from Sonora, which may be the *Canis nigri-rostris* of authors.

Measurements.

Catalogue number.	Locality.	When collected.	Whence obtained.	Original number.	Head and body.	Tail, vert.	Tail, with hairs.
					<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
1014	Fort Dalles, O. T.-----	1855	Dr. Geo. Suckley-----	58	34	13	17½
1011	-----do.-----	1855	-----do.-----	48	42	13	16½
1012	-----do.-----	1855	-----do.-----	49	50	15	20
1010	-----do.-----	Dec. 1, 1854	-----do.-----	47	43	15	19

Very little reliance, however, is to be placed on the indications of measurements given above, the skins being all more or less stretched or distorted.

In examining a large number of skulls of wolves from various localities, I fail to find as yet any decided indications of permanent specific distinction. In investigations into the cranial characteristics of the Carnivora, the wolves especially, it must be borne in mind that the shape of the head varies very much in the same individual with increasing age and more decided longitudinal crest. Young wolves have the width of the head less than half its total length, while the adult may give a proportion of 56 to 100 between the same measurements. In what is incontestibly the same species, too, there may be two sizes of head with precisely the same proportional development in other respects. This may be owing to sex or other causes.

The broadest skulls before me are those of the white and the gray wolves of the Platte, presented by Captain Van Vliet and Dr. W. Hammond. These, however, are also the oldest. Thus, taking the length from the incisive alveoli to the back of the occipital condyle as 100 parts, the width between outside of zygomas varies from 61 in the oldest to 56 in the youngest. Skulls of the same proportions otherwise vary in the width of the muzzle. The following table well exhibits the measurements and proportions of a large number of wolves:

Measurement and comparison of the skulls of the large wolves of America.

No.	Name.	Locality.	Length of skull.	Length from incisive alveoli to condyles.	Greatest width of skull.	Total length to length from incisors to condyles as 100 to—	Total length to width between zygomatica as 100 to—	Length between incisive alveoli and condyles to width between zygomatica as 100 to—
			Inches.	Inches.				
884	White wolf	Platte river.....	10.	9.	5.44	1.00	.90	.60
887	do.....	do.....	9.75	8.90	5.44	1.00	.91	.61
1308	♀ gray wolf.....	do.....	10.	9.10	5.33	1.00	.91	.58
1314	do.....	Fort Kearney	9.75	8.85	5.28	1.00	.93	.58+
1318	do.....	do.....	9.71	9.00	5.38	1.00	.92	.60
1315	do.....	Platte river	9.8	9.10	5.28	1.00	.92	.58
888	White wolf	do.....	9.	8.60	4.91	1.00	.94	.57
1313	Gray wolf	do.....	9.25	8.50	5.05	1.00	.91	.57+
1310	do.....	Fort Kearney	9.25	8.80	5.05	1.00	.95	.57—
1317	do.....	do.....	8.75	8.35	4.75	1.00	.95	.56
1309	do.....	do.....	8.80	8.30	4.76	1.00	.94	.57+
1316	do.....	do.....	8.90	8.25	4.94	1.00	.92	.60—
1311	do.....	do.....	9.	8.40	5.	1.00	.93	.59+
885	Gray wolf	Platte river	9.15	8.45	4.40	1.00	.92	.52
11	do.....	Exploring expedit'n.	9.50	8.80	5.04	1.00	.92	.57+
1194	Gray wolf	Fort Ripley, Minn..	9.90	9.50	5.10	1.00	.95	.54
1804	do.....	Essex county, N. Y.	9.	8.65	4.96	1.00	.96	.57
998	do.....	Hayes co., Texas...	10.	9.25	5.	1.00	.92	.54
1380	do.....	Matamoras, Mex....	8.75	8.25	4.60	1.00	.94	.55
1379	do.....	Saltillo, Mex.....	7.75	7.55	4.05	1.00	.97	.54
2193	do.....	Santa Cruz, Sonora..	8.50	8.	4.57	1.00	.94	.57
1036	♂.....	Sweden.....	9.30	8.90	5.08	1.00	.95	.57
1037	do.....	do.....	9.60	9.15	5.56	1.00	.95	.60
1035	do.....	do.....	10.85	10.	5.78	1.00	.92	.58
910	do.....	Russia.....	9.50	8.50	5.40	1.00	.96	.56
.....	Giant wolf of Townsend.	Oregon	10.70	9.50	5.90	1.00	.95	.55

The only specimen in the collection equally old with the oldest of those from the Platte is No. 1804, from Essex county, New York. This agrees very closely with No. 1311 from the Platte, and is only a little narrower, with rather more slender muzzle. The temporal crest is very strongly marked.

A skull from Fort Ripley, (1194,) Minnesota, equally adult with any, has a narrower forehead; it is of the same proportional width between the zygomatica, if the distance from incisors to condyles be taken as the standard, but narrower in proportion to the total length. It may as well be stated here that there is a considerable disproportion between the excess of the total length of the skull over the distance to the condyles, even in specimens otherwise similar.

One specimen of gray wolf from the Platte (885) is much narrower, and has a longer muzzle than any other in the collection. Its width is but 0.48 of the total length, or 0.52 of the

length to condyles. The one nearest to this is a large head, not very mature, from Hayes county, Texas, in which these proportions are 0.50 and 0.54. A small wolf from Saltillo, (1379,) of about the same age or younger, is a little broader, compared with the total length, and about the same compared with the distance to the posterior edge of the condyles.

One of the most striking specimens before me is the one collected in Oregon by Mr. Peale, and described by him as *Canis occidentalis*. The skin has a good many characteristics of the Sonora "*Canis mexicanus*," the under jaw quite dusky, a decided collar of black tipped hairs in front of the shoulders, &c. The skull, too, is very similar, and of the same age, but is a good deal larger; both agree in standing higher, when laid flat on a table, than others, owing partly to a higher ramus of the lower jaw, partly to the greater height of the cranium. The elevation and swelling of the head just behind the postorbital processes in both is unusually great. It is to this Oregon specimen that Townsend refers as being the same with his giant wolf—*Lupus gigas*. There are certainly some very remarkable proportions in the table of measurements given by Dr. Morton in Townsend's article on the giant wolf, although they are not very different from those of the adult white wolves of the Upper Missouri. A skull of a Swedish wolf (1035) is absolutely longer than that of the giant wolf, but rather narrower; the breadth of forehead is ten inches. In another specimen (1037) the zygomatic diameter is greater than in the giant wolf, and the forehead measures 1.94. This would be in the proportion of 2.15 inches to 2.40, if of the same length as that of the giant wolf.

The Swedish and Russian wolves in the collection are every way as broad as those of the Upper Missouri, and in fact there is no appreciable difference between No. 1037 and the average of white wolf skulls in the Smithsonian collection.

The skeletons of Missouri and Swedish wolves exhibit some interesting differences on comparison, although I am unable to say whether these differences are constant and specific. No. 1308 from the Platte is a little larger than 1036 from northern Sweden, both being males. Their skulls measure respectively 10 by 5.33 and 9.30 by 5.08, the proportions of transverse diameter to longitudinal being as 53 to 100 in one, and 54 to 100 in the other. The cervical vertebræ are about the same length; those of the trunk, however, are considerably longer in the American wolf. The scapula is considerably larger in the American wolf; the cervix and articular surfaces, on the contrary, are decidedly smaller and narrower. The humeri and bones of the fore arm are of nearly the same length in both; those of the American specimen, however, appreciably more slender, particularly the ulna. The pelves of the two specimens are in about the same proportions as the scapulæ; the femora are the same length, that of the Swedish specimen the stoutest, especially at the lower extremity. The tibia of the Swedish wolf, however, is absolutely longer, and in every way larger than the other.

It thus appears from the above comparison that the long bones of the Swedish specimen are stouter and longer in every way, particularly the tibia. The cervical vertebræ appear to be larger and those of the trunk rather smaller.

In conclusion, as already stated, I am not able to come to a decision as to the absolute number of species of North American wolves. Of the existence of varieties of color, and perhaps of form and internal structure, there is no doubt. The comparison of a large number of specimens from many localities, however, will be required to settle permanently all the questions connected with this subject. For the present I prefer to consider all as one species, and to assume this with good reason as distinct from some at least of the European wolves, if that continent possesses more than one.

Since the preceding article was written, a large amount of additional material has been received by the Smithsonian Institution, from the western explorations of Lieutenant G. K. Warren and Lieutenant F. T. Bryan, embracing numerous specimens of skins, skeletons, and skulls. The time allowed for completing this report is, however, too short to permit me to re-examine the questions mooted above with the view of coming to a satisfactory conclusion. I can only say, in general terms, that these collections embrace specimens entirely of a yellowish white, all of a very large size, and giving indication of great age, and others varying through all intermediate stages to gray, with black tipped hairs, leaving no doubt as to their specific identity. Thus, No. 1856, from the Yellowstone, is everywhere of a yellowish white, the bases of the dorsal hairs, with a slightly brownish tinge, most conspicuous on the shoulders. There are a few much scattered black hairs, only visible on close examination. The fore leg exhibits no trace of the wolf mark. Two specimens from the south fork of the Platte agree with this one.

In No. 1858 the general color is similar, with more black hairs, and a deeper brown on the bases of the dorsal hairs, detracting from the purity of the white. There are some black hairs on the upper side of the tail. No bands on the leg; animal very old.

In 1862, 1861, 1859, the prevalent tint above is of a dirty light-brownish rusty; decidedly rusty on the back of the head, neck, and ears; mixed with this are tufts of long hairs, white at base, then black, then white, and tipped with black. The tail is tipped with black. There is an indistinct dusky band down the anterior face of the fore leg; not so old as the preceding. No. 1868 from the North Fork of the Platte agrees with these.

In No. 1860 the pelage is in excellent condition; the long hairs grown out all over the back, and concealing the basal fur. The prevailing color above is grayish white, waved with black, tipping the hairs. On the sides, the under fur only is seen, of a light ferruginous. The upper parts and tip of the tail are black, the latter with some white hairs. Face gray, nape and region about the ears pale rusty, with some black. There is no band on the leg.

No. 1857 is a young animal with deciduous teeth. It agrees with the last, but is of a less rusty tinge. The prevailing color above is a light ash gray, waved with black. There is a distinct dusky band down the fore legs.

A skin of a wolf from Ohio, kindly loaned by Dr. Kirtland, agrees with No. 1860, but is rather more rusty.

The following is a translation of Prince Maximilian's remarks on the varying wolf of the Upper Missouri, as made in his *Reise in das innere Nord-Amerika*, II, 1841, 95.

"*Canis variabilis*.—This wolf is distinguished from that of the eastern States (which resembles the European species) by the somewhat smaller size, shorter, thicker snout, somewhat shorter ears, and by the want of the dark stripe running down the legs in *C. lupus*, of Europe; also by the color varying from the ordinary wolf's gray to pure white. In any troop of these animals, one may see some that are entirely white and pale, some more mixed with gray, and others that are entirely gray. In the living animal the iris is whitish-gray, washed with yellowish, dotted with dark on the external border, and colored with yellowish-brown around the pupil. In a word, the iris is pale yellowish gray-brown, darker around the pupil.

"*Color of the gray variety of this wolf*.—Around the eye, the cheeks, and sides of the snout, whitish; forehead mixed with gray; top of the nose pale reddish; the short truncated ears are pale grayish-yellow; upper parts of the animal are yellowish-gray, with decided black tips to

the hairs; legs, belly, and lower parts of the body, unmixed whitish. The dark longitudinal stripe on the fore legs of *C. lupus* is not found in this species.

	Feet.	Inches.	Lines.
Total length.	5		
Tail to end of hairs.		16	
Tail to end of vertebrae.		12	5
Length of head.		09	
Height of ear.		03	6
Breadth of head between ears.		03	6
Length of upper canine.		01	1
Lower canine.			11

“A specimen of this wolf, killed at Fort Clark, and reduced by hunger, weighed 58 pounds, and the penis bone was 4" 7" long.

“The varying wolf brings forth four to nine young in April, in its burrow.”

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Age & sex.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n	Collected by—
1014			Fort Dalles, O. T.	185	Dr. Geo. Suckley.	58	Skin	
1011			do.		do.	48	do.	
1012			do.		do.	49	do.	
1010			do.	Dec. 1, 1854		47	do.	
1856			Yellowstone river.	1856	Lt. G. K. Warren.		do.	Dr. F. V. Hayden.
1857			do.	do.	do.		do.	do.
1858			do.	do.	do.		do.	do.
1859			do.	do.	do.		do.	do.
1860			do.	do.	do.		do.	do.
1861			do.	do.	do.		do.	do.
1862			do.	do.	do.		do.	do.
1868	2566	♂	North Platte riv.	Aug. 21, '56	Lt. F. T. Bryan.	290	do.	Wm. S. Wood.
1869	2567	♂	Republican Fork of Platte.	Sept. 30.	do.	365	Skin, in alcohol	do.
1870	2568	♂	do.	Oct. 2, 1856	do.	368	do.	do.

CANIS OCCIDENTALIS, var. NUBILUS.

Dusky Wolf.

Canis nubilus, SAY, in Long's Exped. R. Mts. I, 1823, 168.

HARLAN, Fauna Amer. 1825, 84.

FISCHER, Synopsis, 1829, 183.

DOUGHTY's Cabinet Nat. Hist. II, 1832, 265; plate xxiii.

CH.—Color, light sooty, or plumbeous brown.

The only perfect specimen of this wolf before me is rather small, and otherwise not in very good condition. It is about the size of a pointer dog. The muzzle is long and acute; the width between the eyes about one and three-quarter inches; the distance from muzzle to eyes,

three and a half inches ; the muzzle is naked and black. The ears are of moderate size, scarcely so large as those of the prairie wolf, measuring three inches along the anterior edge. They are erect, pointed above, well covered with hair, except around the naked meatus. The feet are rather shorter in proportion than in the prairie wolf; as in all the dog family there are four toes each, with blunt stout claws on each foot, and on the fore foot a rudimentary thumb in addition, with a sharp claw attached. The naked pads under the feet are of considerable extent.

The tail is short, not more than half the length of body and neck, exclusive of head. It is quite full and tufted.

The hairs on the body, generally, are of two kinds, a rather soft under fur, with long hairs interspersed. The same condition prevails in the tail where, however, the long hairs are slightly crimped or curled.

The general aspect of this animal is of a dusky plumbeous, with cloudings of black and shades of grayish on the sides of neck, shoulders, and back. The ears, head, and legs are almost black, with occasional grayish hairs. The sides of the neck and body and under parts are plumbeous gray, with a preponderance of dusky on the throat and between the fore legs. The upper parts show cloudings of black, the amount increasing to the tail, which is black externally, with plumbeous gray showing through.

The soft fur on the middle of the back is plumbeous brown, lighter anteriorly, and becoming paler towards the sides and on the belly. The long hairs which form a kind of mane between the shoulders, and are there five inches long, are grayish-white at the base, then dark brown, then again grayish-white and tipped with black. The basal white is concealed among the fur; the subterminal portion gives the grayish shades of color. On the tail the hairs are grayish-white from the base beyond the middle, and tipped with black. The hairs on the extreme tip of the tail are black throughout.

The specimen described above is from Fort Union, Nebraska. A skin brought by Dr. Suckley from Puget's Sound is almost precisely similar; it is, however, larger, and with a greater proportion of black, this color on the long hairs encroaching on the cinereous or grayish portion, which is clearer than in the Fort Union skin.

Dimensions of No. 46.

	Inches.
From nose to root of tail	36
Tail to end of vertebræ.....	10
Tail to end of hairs.....	13½

The *Steilacoom* species must have been considerably larger, measuring a little over three feet from the ears to the root of the tail.

List of Specimens.

Catalogue number.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
46	Fort Union, Nebraska.....	1850	A. Culbertson.....		Skin.....
1013	Steilacoom, W. T.....	1855	Dr. Geo. Suckley, U. S. A.	66	do.....

CANIS OCCIDENTALIS, var. MEXICANUS.

Mexican Lobo Wolf.*Canis Mexicanus*, GM. Syst. Nat. I, 1788, 71.

SHAW, Gen. Zool. I, 1800, 296.

DESM. Mamm. I, 1820, 199.

FISCHER, Syn. 1829, 183.

BERLANDIERE, Pr. A. N. Sc. Ph. V, Feb. 1851, 157.

SP. CH.—Varied with grey and black. Neck maned more than usual. A black or dusky band encircling the muzzle. A dusky stripe down the fore leg.

For the description of a strongly marked specimen, (No. $\frac{10550}{2193}$, collected at Santa Cruz, Sonora,) of this variety, I would refer to the report on the zoology of the United States and Mexican Boundary Survey.

The following varieties of the large American wolf I have not had an opportunity of examining:

CANIS OCCIDENTALIS, var. ATER.

Black Wolf.*Canis lycaon*, HARLAN, F. Am. 1825, 126.*Canis (Lupus) ater*, RICH. F. B. A. I, 1829, 70.

AUD. & BACH. N. A. Quad. II, 1851, 126; pl. lxxvii.

This wolf, which is entirely black in color, according to Audubon and Bachman, is found most abundantly in Florida—occasionally in Georgia and other southern States. It was formerly common in Kentucky, and, according to Say, on the banks of the Missouri, where, however, it is now rarely seen.

CANIS OCCIDENTALIS, var. RUFUS.

Red Wolf.*Canis lupus*, var. *rufus*, AUD. & BACH. N. A. Quad. II, 1851, 240; pl. lxxxii.

According to the above authority, this is the most common variety of wolf in Texas. Its color is a mixed red and black above, lighter beneath.

CANIS LATRANS, Say.

Prairie Wolf. Coyote.*Canis latrans*, SAY, in Long's Exped. R. Mts. I, 1823, 168.

HARLAN, F. A. 1825, 83.

FISCHER, Synopsis, 1829, 183.

RICH. F. B. A. I, 1829, 73; pl. iv.

DOUGHTY'S Cabinet Nat. Hist. I, 1830, 73; pl. vii.

MAXIM. Reise, II, 1841, 96.

AUD. & BACH. N. A. Quad. II, 1851, 150; pl. lxxi.

? *Canis ochropus*, ESCHSCHOLTZ, Zool. Atlas, III, 1829, 1; pl. xi. (California.)

GRAY, Zool. Sulphur, 1844, 32; pl. x. (California.)

Canis frustror, WOODHOUSE, Pr. A. N. Sc. Ph. V, Oct. 1850, 147.—IB. V, Feb. 1851, 157.—IB. Sitgreaves' Exped.

Zuffi & Colorado R. 1853, 46.

" *Lyciscus calottis*, HARM. SMITH, Nat. Lib. Dogs."

This animal is intermediate in size between the fox and the wolf; resembling the former in sharpness of muzzle, the latter in form and character of the tail. It is a true wolf, however,

in its entire osteological characteristics, or rather may be said to replace the jackals of the old world.

In size, the prairie wolf, or coyote, considerably exceeds the North American foxes; although not much larger than the *Canis magellanicus* of Chile. The muzzle, as stated, is as long, sharp pointed, and slender as in the red fox; the eyes moderately approximated. The ears are very large, triangular, erect, and coated with hair, except around the meatus, where they are nearly naked. The feet are moderately long and rather slender; the pads on their under surfaces large, naked, and black; five in number; beneath the carpal joint is another projecting naked callosity. There are but four digits to each foot; there is, however, a sharp claw, about two inches above the sole of the fore foot, placed on the inside, and attached to the rudiment of the thumb. The tail is less than half the length of the head and body; quite bushy, but tapering to a rather attenuated tip.

The hair on the body is coarse and not very dense; there is an under fur, overlaid by straight stiff hairs.

The prevailing colors of this species are a dull, yellowish grey on the back and sides, with a clouding of black, caused by the tips of the hairs being of this color. The under fur is light plumbeous at the base, the terminal and larger portion being pale rufous, lightest on the sides and the anterior of the back. The long hairs themselves are whitish at the base, then black, then yellowish white, and then again black; the first annulus of black being longest, the others of about the same length. The under parts generally, with the insides of the thighs and axillæ are dirty white. The central upper line of the muzzle is somewhat like the back, except towards the end, where it is dull rusty, as are the sides of the muzzle anterior to the eye. The convexity of the ear and its basal region behind are yellowish rufous, somewhat mixed with black points; the exterior of the limbs strongly tinged with light rufous, sometimes being very decidedly so; there is, however, an occasional mixture of black hairs, which, on the inner portion of the anterior face, on the fore arm and thigh, are condensed into an obsolete line or stripe.

The tail resembles the corresponding regions of the back very much; the base of the fur is, however, darker, the tips less rufous, the long hairs less abruptly and distinctly annulated. There is a larger proportion of black on the terminal hairs, producing a decided tip of this color. A few entirely white hairs in the tips represent the white tuft of the foxes.

The specimen just described (667) is from Bodega, California, and was killed in February; it agrees essentially with another, (No. 1389,) from San Francisco. A summer specimen from Texas has a considerable proportion of yellowish rusty on the top of the head, and the whole of the legs are uniformly of this color except on the inner surfaces, which are rusty white. The anterior edge of the thigh lacks the dark line described, although that on the fore leg is quite distinct. The ears are decidedly smaller.

Dimensions of No. 667, (skin.)

	Inches.
Nose to base of tail.....	38
Tail to end of vertebrae.....	15
Tail to end of hairs.....	17½
Height of ears behind.....	3½

The specimen of this animal collected in the San Francisco mountains is about the bulk of the pointer dog. The muzzle is slender and pointed; the head narrow. The ears are very large, measuring four inches above the notch; they are well covered with hairs, except around the meatus. The tail is unusually dense and bushy, much more so than in any coyote I have seen.

The general color of this animal is a rusty grey, with shadings of black on the back and sides. The under parts are greyish white.

A specimen collected by Dr. Woodhouse, on the Yampai river, has softer fur and less black on the back than some others.

With Dr. Woodhouse's original specimens before me, I cannot admit *Canis frustror* to the rank of a distinct species, whether it be distinct or not from the true *Canis latrans*. It is, indeed, of small size, not half that of the adult prairie wolf, but the skull is that of a very young animal. Not a single one of the permanent teeth has been cut, the dentition being entirely deciduous. (Incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, molars $\frac{3-3}{3-3} = 28$.) Compared with the skull of a young prairie wolf from the Upper Missouri, (No. 205,) there is no appreciable difference, except that the latter is a trifle smaller, and has rather a narrower muzzle. The animal itself is in rather better pelage, showing, in two mounted specimens, an abundance of long stiff hairs on the body, rather a large proportion of black tips to the hairs of the back, and a considerable amount of black on the tip and sides of the tail. The ears are larger than in Dr. Suckley's specimen. If the adult animal never exceeded Dr. Woodhouse's specimens in size, occurring at the same time with other adults much larger, there would be good reason for considering it distinct. There is, however, absolutely no doubt, from comparison with the skin and skull of young prairie wolf No. $\frac{205}{1176}$, from the Upper Missouri, that when adult, the size of the specimens would not be appreciably less than that of the average of prairie wolves, (*Canis latrans*.)

I regret that no mature specimens of the prairie wolf from the upper Missouri have come under my observation, as I have, in consequence, had no opportunity of comparing them with the coyotes of California and Mexico. No appreciable difference can be detected in the descriptions of Maximilian. The description in Audubon and Bachman was taken from a Texas specimen. The animal described by Richardson, from the plains of the Saskatchewan, appears to be smaller, with shorter ears. The colors are more grey also.

A very young prairie wolf, collected by Dr. Suckley, west of Fort Union, (205,) has very few long hairs, the body being covered entirely by a soft woolly fur, rather finer than the under fur of the adults. The general color is a pale yellowish grey, tinged with rufous on the top of the head and on the muzzle. There is a slight sooty shade over the body, caused by black tips to the hairs, grizzled with greyish. The ears are shorter than in specimens collected by Dr. Woodhouse.

After a careful examination of over twenty skulls of the prairie wolf of the Platte, with nearly as many from California, New Mexico, and Texas, I must candidly confess my inability to detect any very striking distinctive characteristics among them. By selecting a single specimen from each series, it would be no difficult matter to establish specific differences between them, but in a large number from the same locality the distinctions disappear. In the Platte skulls some are much broader than others, with shorter muzzle; there is also a great variation in the diameter between the orbits. The sectorial teeth in skulls of the same length differ in length sometimes by an eighth of an inch. The shape of the coronoid process varies exceedingly, as does, to some extent, the width of muzzle. Perhaps in the skulls before me there is, in the

Platte specimens, on an average, a greater height of the zygoma anteriorly, a narrower forehead between the eyes, and a rather decided average superiority in the length and width of the sectorial teeth. Still specimens may be found not exceeding, in this last respect, the Rocky mountain and California specimens, and all the other characters of these are reproduced in one or other of those from the Platte.

A fact, however, of some importance is, that in none of the Texas or California specimens are there any with sectorial teeth so large, or with zygomata so high, as in a number of Platte skulls. It is possible that, with a difference of species, two or more may be found on the Platte and upper Missouri. Still these differences of condition do not admit of any assorting into series, as even if several specimens agree in one point and disagree with all the rest, a new combination is required if a different character be selected as the test.

Upon the whole I am inclined to think that the differences in the skulls from the Platte are due entirely to age, sex, and perhaps race. The young skull widens considerably in its lateral dimensions, independently of the elevation of the median crest. The female preserves through life more the characters of the young skull as to proportions. Sometimes a small skull will indicate extreme age in the worn condition of the teeth, when not much more than three-fourths the size of another with teeth entirely perfect.

A very immature skull of the prairie wolf, (1176,) from the upper Missouri, differs materially from the adult. The most striking feature is the entire absence of the post-orbital process of the frontal bone, without even a slight fossa to indicate its position. It would almost seem as if this were formed by the strong compression of the temporal region just behind a certain point in the orbit, and under the place of attachment of the muscles of the temples.

There is no trace of any temporal, sagittal, or occipital ridge. The dried skin of the palate shows the existence of ten transverse ridges of the soft palate.

The teeth are entirely the deciduous ones and present the following formula: Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{3-3}{3-3} = 28$. These are, as usual, much smaller than their successors. The incisors are shaped like their successors, the upper ones trilobed, the lower, bilobed; the outer upper incisors instead of having, as in the adult, no lobes at all, have a slight one on the inner edge and a small spur externally, about midway to the base. The upper canines are very much more curved and hooked than their successors, without sharp ridges. The lower incisor is likewise shorter and more curved than its successor, and when viewed from in front, exhibits a prominent angular spur on the inner anterior edge. The first upper molar is very low and obtuse with a tubercle behind. The second molar is shaped like the adult sectorial tooth, except that the inner spur, with its pointed tubercle, is situated opposite the base of the middle lobe. There are also two additional tubercles, one at the base of the anterior trenchant edge of the long pointed lobe of this tooth, and another a little in advance and exterior to it at the anterior extremity of the tooth. The single tubercular molar resembles the first true or tubercular permanent molar, but is much simpler. There are the two external tubercles and the two which are seen nearly in the centre of the permanent tooth, but these form the exterior boundary instead of being enclosed as in the adult, by a wall which, commencing on the anterior wall of the tooth and passing down below the level of the anterior tubercles, comes gradually up on the inner side of the tooth, and constitutes a distinct compressed tubercle on the interno-posterior corner. This wall is wanting entirely in the deciduous tooth. The lower temporary sectorial is quite similar to the permanent one, except that the posterior edge of the middle lobe is nearly opposite to the centre of the tooth, instead of the posterior third.

The present skull is exactly similar, except in being a little smaller, to that of the specimen upon which Dr. Woodhouse founded his supposed diminutive species of Coyote, under the name of *Canis frustror*.

The following table of measurements will illustrate the above remarks. In addition to the absolute dimensions, a column of proportion gives the width of the skull in terms of hundredths of the length from the anterior extremity of the bony alveolus of the incisors to the posterior portion of the occipital condyles.

Measurements and comparison of the skulls of prairie wolves.

Length of skull taken from the anterior edge of the alveolar processes of the incisors to the most backward portion of the condyles.

Lower jaw measured from the anterior border of the incisive alveolar to the posterior edge of condyle.

No. of skull.	Locality.	Sex.	Length of lower jaw.		Length of skull.		Width of skull.	
1327	Fort Kearny, Neb.	Female.	4.90	.72	6.78	1.00	3.69	.54
1331	-----do-----	do-----	5.08	.78	6.50	1.00	3.76	.57
1338	-----do-----	do-----	5.15	.76	6.73	1.00	3.63	.53
818	Fort Pierre, Neb.	do-----	5.13	.78	6.56	1.00	3.67	.55
1335	Fort Kearny, Neb.	Male----	5.27	.75	7.02	1.00	3.82	.54
1332	-----do-----	Female.	5.10	.75	6.77	1.00	3.57	.52
1339	-----do-----	Male----	5.28	.76	6.93	1.00	3.62	.52
1340	-----do-----	do-----	5.40	.76	7.10	1.00	3.53	.49
1336	-----do-----	Female.	5.35	.78	6.84	1.00	3.75	.54
1326	-----do-----	do-----	5.06	.75	6.73	1.00	3.62	.53
1341	-----do-----	Male----	5.29	.76	6.93	1.00	3.56	.51
1342	-----do-----	Female.	5.70	.77	7.34	1.00	3.93	.53
1333	-----do-----	do-----	5.08	.77	6.58	1.00	3.42	.52
1329	-----do-----	do-----	5.12	.77	6.58	1.00	3.50	.53
1334	-----do-----	do-----	5.00	.75	6.60	1.00	3.38	.51
1328	-----do-----	do-----	5.30	.76	6.93	1.00	3.58	.51
1337	-----do-----	do-----	5.16	.77	6.75	1.00	3.45	.51
889	Grand Isle, Platte river.....	do-----	4.87	.72	6.49	1.00	3.30	.50
1330	Fort Kearny, Neb.	do-----	4.90	.76	6.50	1.00	3.23	.49
1218	San Diego, Cal.		5.66	.78	7.20	1.00	3.76	.52
999	Copper Mines, N. M.		5.73	.77	7.40	1.00	3.62	.48
1000	-----do-----		5.30	.74	6.85	1.00		
1001	-----do-----		4.96	.76	6.50	1.00	3.28	.50
975	Frontera, Texas		5.24	.74	6.77	1.00	3.59	.52
1916	Columbia river.....		5.50	.76	7.20	1.00		
1114	Eagle Pass.....				6.70	1.00	3.70	.55
1019	Texas.....				6.50	1.00	3.50	.53
1607	San Francisco Mountains, N. M.				6.60	1.00	3.50	.52
2'98	-----do-----		5.33	.76	7.00	1.00	3.64	.52

NOTE.—The second columns under each head gives the length or width in terms of hundredths of the distance from incisive alveoli to the most posterior portion of the occipital condyles.

A comparison of the only two skeletons of prairie wolf before me gives the following results as the difference between the prairie wolf of the Platte (No. 1326) and the coyote of El Paso, Texas (1001.) The former is a larger and heavier animal, and is marked female, from three to five years. The latter has no indication of age or sex.

In the Platte skeleton the vertebræ are heavier, and their bodies much longer than in the other, thirteen dorsal and lumbar vertebræ of one corresponding in length to fourteen of the other. The long bones, too, of 1326 are much the stoutest and thickest; the humerus and femur are of nearly the same length, rather longer in 1326. The fore arm and tibia, however, of the Texas specimen are very appreciably longer than in 1326, the tibia of 1001 exceeding that of 1326 by nearly half an inch. The heads of these species measure respectively 6.73 and 6.50 inches.

It thus appears that the Texan animal is relatively shorter, more delicately built, and with longer fore arm and leg. The vertebral formulæ are as follows:

1001.—C. 7; D. 13; L. 7; S. 3; C. 19; Texas.

1326.—C. 7; D. 13; L. 7; S. 3; C. 20; Platte.

The skull of No. $\frac{483}{2189}$ from the San Francisco mountains exhibits in a more marked degree the difference in breadth referred to above than any other, and it would really seem as if the coyotes of the central regions of North America, along the Southern Rocky Mountains, differed specifically from those of the Missouri, as indeed in a measure from those of California and Eastern Texas. Thus, on comparing the skull of No. 483 with one from the Platte, corresponding as nearly as possible with it in general characteristics, the least distance between the orbits is 1.44 of an inch instead of 1.28, the latter being much the greatest width of any of 25 Missouri skulls; in these the more usual distance is from one inch to $1\frac{1}{16}$. The distance between the points of the orbital process in the skull of 483 is two inches; fully half an inch greater than in most of the Missouri skulls. The skull between the orbits is nearly plane, with a slight depression towards the centre. The lower jaw is more undulating in its lower outline, and is narrower just back of the molars.

There are no characteristic differences in the teeth; the third lower premolar lacks a small lobe on the middle of the posterior edge seen in the other skull. The upper sectorial is rather shorter and wider anteriorly. These differences, however, may be readily noticed in skulls from the same locality.

Upon the whole, I find, then, that specimens from the vicinity of the Rocky Mountains differ very appreciably in the skull and skeleton from those of the Upper Missouri; the one having a broader and flatter forehead, more slender bones and longer fore arm and tibia, the other having a greater depression in the middle of the interorbital space, less width between orbits and orbital processes, and larger sectorial tooth. Whether external differences exist can only be determined by more specimens. A specimen from Eagle Pass, Texas, has shorter ears and brighter colored legs than any other; its skull is intermediate in width and flatness of interorbital region between the Rocky Mountain and Missouri specimens. The *Canis frustror* of Dr. Woodhouse is a very young animal, two specimens of which differ very appreciably from each other. Specimens from any given locality differ in amount of black on the body, size of the tail, general color, softness of fur, width of skull, and of interorbital space.

If a name be appropriate for any specimens as distinct from *C. latrans*, it is most applicable to the El Paso, Coppermines and San Francisco mountain ones. The name of *C. ochropus* will not answer, as they differ from California coast specimens as much as from those of the Missouri.

Should adult specimens from the locality of *Canis frustror* agree with them, then this name may be selected. It is possible that this specimen may belong to a Mexican species, which extends into the Territories of the United States only along the central table land and mountain range. The description by Wagner of a Mexican specimen will answer, in the absence of notes on the skeleton, for *Canis latrans* in general. What the *Lyciscus cayotis* or Mexican coyote of Hamilton Smith may be I am not at present able to say.

Since the preceding article was written, additional specimens have been received without shedding much more light on the subject of the number of species of prairie or coyote wolves. Some of these from the Upper Missouri agree very well with those described. One collected in the Mesilla valley has a very full and long tail, larger than in most others. I have not time now to remove the skull and ascertain how far it agrees with the others described from the same vicinity. Its character of densely and fully furred tail and general color approximate it closely to the specimen from the San Francisco mountains, No. 483, and substantiate still more the remarks made above on the possible existence of a coyote in the Rocky mountain region, specifically distinct both from that of the Upper Missouri and of the Pacific coast.

The following detailed description of a fresh specimen of *Canis latrans* from the Upper Missouri, by Maximilian, taken from his *Reise in das innere Nord Amerika*, II, 1841, 96, will be read with interest.

Canis latrans.—The prairie wolf in size and shape occupies a position exactly intermediate between the wolf and fox, in dentition, however, agreeing more closely with the wolf, inasmuch as the front teeth are lapped on either side. The shape is wolf-like, the neck short and thick, the body thick; the head, however, is smaller and somewhat more like that of the fox. The tail is short and thick, as in the wolf, the legs tolerably high; the snout longer and more pointed than in the wolf; the ear is tolerably pointed, strong, firm, and shaped as in the wolf.

The head is broad above, the end of the nose black and moist, the internal ear well haired, the whiskers long and black; other similar long hairs are implanted above the eye and behind the corner of the mouth; the tail hangs down as far as the heel joint, and with the points of the hair reaches over half the heel.

Color.—The entire animal is of a dirty greyish yellow; reddish yellow on the ears and top of the nose, with black tips to the hairs on the neck, back, tip, and upper surface of the tail, and of the sides of the neck and limbs, bright rusty yellow, or rusty reddish. Lower parts and inner side of the limbs whitish. Ears rusty yellow, with scattered black tips to the hairs; internally whitish. Forehead and region about the eye pale greyish brown, with whitish tips to the hairs. Edge of upper jaw whitish; lower jaw margined externally with blackish, elsewhere whitish.

The hairs on the upper parts of the body are $4\frac{1}{2}$ inches long, close, ash grey at the root, then yellowish red for two-thirds the length, then with a blackish brown space, then whitish, and finally tipped with black. Hairs on the sides $1\frac{3}{4}$ inches long. In many individuals the rust color is entirely wanting, and a whitish grey predominates. The pupil is round, the iris is greyish yellow.

	Inches.	Lines.
Total length	43	7
Tail to tip of hairs	14	2
Tail to tip of vertebrae	11	3
Length of head	7	9
Height of ear above the crown	3	11
Greatest breadth of ear	2	5
Length of upper canine		8½
Bone of the penis	2	3½

The prairie wolf brings forth its young in its burrows in April, sometimes as many as ten in number. Its voice is a bark, like that of the domestic dog.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Original number.	Collected by.
667	2199	-----	Bodega, California.....	Feb., 1854	Lt. W. P. Trowbridge..	Skin.....	-----	T. A. Szabo
1389	-----	-----	San Francisco, California.....	-----	do.....	do.....	-----	-----
483	2198	-----	San Francisco mountains, New Mexico.	-----	Lt. A. W. Whipple.....	do.....	-----	Dr. C. B. Kennerly. A. Schott
128	1114	-----	Eagle Pass, Texas.....	April, 1852	Major W. H. Emory ..	do.....	-----	do.....
1712	-----	Q	Mesilla Valley, N. M.....	Jan., 1856	Capt. J. Pope	do.....	174	-----
1713	-----	♂	do.....	Jan. 22, '56	do.....	-----	175	-----
1834	-----	-----	Fort Pierre, Nebraska.....	1856.	Lt. G. K. Warren.....	-----	-----	Dr. F. V. Hayden.
1712	-----	-----	do.....	-----	do.....	-----	-----	do.....
1713	-----	-----	do.....	-----	do.....	-----	-----	do.....
1863	-----	-----	do.....	-----	do.....	-----	-----	do.....
1524	-----	-----	Upper Missouri.....	-----	do.....	-----	-----	do.....
1823	-----	-----	Mouth of Vermilion	Oct. 25, '56	do.....	-----	-----	do.....
205	1176	-----	Bois de Sioux, Nebraska.....	1853.	Gov. I. I. Stevens....	Skin.....	-----	Dr. Geo. Suckley.
2340	-----	-----	Fort Riley, Kansas	Feb., 1857	Dr. W. A. Hammond ..	-----	-----	-----
2341	-----	-----	do.....	do.....	and L. de Vesey.....	-----	-----	-----

SUB-FAMILY VULPINAE.

Pupil of the eye elliptical. Head slender. Upper incisors scarcely lobed. Post-orbital process of the frontal bone bent but little downwards, the anterior edge turned up; a longitudinal shallow pit or indentation at its base.

It is in this group of the *Canidae* that we find the animals known in North America and the Old World as foxes, several species of which belong to this continent. Among these there are several very distinct types, with one or more species in each. In the one, the tail is uniformly bushy all round, composed of long hairs mixed in among the short fur, in nearly uniform proportion. The skull is more or less wolf-like in shape; the temporal crests generally approaching each other and nearly coalescing as far forward as the parieto-frontal suture or farther. The muzzle is long, and the centre of the bony orbit falls about opposite the middle of the axial line of the head. To this group the name of *Vulpes* should be applied.

In the other section, illustrated by the gray fox of North America, the temporal crests never approach each other, but are separated on the parieto-frontal suture by a space of nearly an inch. The muzzle is very short, though pointed; the centre of the bony orbit anterior to the middle of the axial line. The most striking feature, however, is in the tail, which, instead of being uniformly bushy, as in the red fox, exhibits, on close examination, a concealed erect mane of stiff hairs along the upper line, unmixed with fur at all, on each side of which the rest of the hair is arranged, falling down on the sides in a manner quite different from what it is in the red fox. To this group, if of generic value, may be applied the name of mane-tailed foxes. The following diagnosis will serve to show the points of contrast more clearly:

A. Tail with soft fur and long hair, uniformly mixed. Muzzle long. Temporal crests coming nearly in contact.—*VULPES*.

B. Tail with a concealed mane of stiff hairs, without any soft fur intermixed. Muzzle short. Temporal crests always widely separated. A supplementary tubercle on the lower sectorial. The under jaw with an angular emargination below.—*UROCYON*.

In order to illustrate more fully the detailed descriptions of the skulls of the different American foxes, and the comparison of the European *V. vulgaris* with its allied American species, I have prepared several comparative tables of measurements and proportions, which may not be without interest. I need hardly repeat here what I have already stated, that all these statistics are entirely original, and, like the descriptions of the animals themselves, based on the examination of specimens in the Smithsonian collection, unless when stated expressly otherwise.

TABLE A.—Comparative measurements of the skulls of the different American and European foxes.

Current number.	Name.	Sex & age.	Locality.	Total length.		Distance between ends of intermaxillaries and condyles.		Width between zygomata.		Height above base of cranium.		Least width of muzzle behind canines.	
				Ins.	100ths.	Ins.	100ths.	Ins.	100ths.	Ins.	100ths.	Ins.	100ths.
VULPES.													
1325	<i>Vulpes macrotis</i> ...	♀	Fort Kearney	5.76	1.00	5.60	.97	2.82	.48	1.60	.27	.84	.14
1884	do	♂	Fort Dalles	5.70	1.00	5.45	.95	2.83	.49	1.62	.28	.77	.13
678	<i>Vulpes fulvus</i>	♂	Carlisle, Pa	5.56	1.00	5.43	.97	2.92	.52	1.55	.27	.89	.16
2005	do		Middleboro', Mass					2.87				.83	
1212	do		Cleveland, Ohio	5.47	1.00	5.19	.94	2.83	.51	1.58	.28	.85	.15
768	do		Carlisle, Pa	5.17	1.00	5.00	.96	2.71	.52	1.50	.29	.82	.15
767	do		do	5.40	1.00	5.27	.97	2.90	.53	1.59	.29	.87	.16
683	do		do	5.50	1.00	5.36	.97	2.91	.52	1.60	.29	.82	.14
662	do		do	5.45	1.00	5.24	.96	2.83	.51	1.53	.28	.85	.15
810	do		do	5.43	1.00	5.23	.96	2.96	.54	1.65	.30	.89	.16
1188	do		Essex county, N. Y.	5.43	1.00	5.28	.97	2.88	.52	1.60	.29	.87	.16
1038	<i>Vulpes vulgaris</i>		Sweden	5.62	1.00	5.43	.96	3.06	.54	1.60	.28	.94	.16
868	do		Nurnburg	5.57	1.00	5.37	.96	3.12	.56	1.62	.29	.96	.17
790	do		England	5.57	1.00	5.35	.96	3.01	.54	1.55	.27	.96	.17
870	do		Nurnburg	5.38	1.00	5.28	.99	3.06	.56	1.58	.29	.87	.16
869	do		do	5.55	1.00	5.32	.96	3.06	.55	1.60	.28	.94	.16
1030	<i>Vulpes lagopus</i>		Lapland	5.05	1.00	4.88	.96	2.75	.54	1.53	.30	.91	.18
1040	do		do	5.17	1.00	5.05	.97	2.80	.54	1.59	.30	.88	.17
1347	<i>Vulpes velox</i>	♀	Platte river	4.35	1.00	4.31	.96	2.38	.54	1.36	.31	.70	.16
1348	do	♂	do	4.16	1.00	4.10	.96	2.36	.56	1.32	.30	.64	.15
1344	do	♀	do	4.25	1.00	4.23	.99	2.42	.56	1.34	.31	.67	.15
1343	do	♀	do	4.38	1.00	4.32	.99	2.50	.57	1.35	.30	.75	.17
1345	do	♂	do	4.46	1.00	4.44	.99	2.46	.55	1.35	.30	.69	.15
1346	do		do	4.32	1.00	4.32	1.00			1.23	.30	.72	.16
951	do		Fort Union					2.70				.78	
UROCYON.													
771	<i>Vulpes virginianus</i> ..		Perry county, Pa.	4.72	1.00	4.62	.97	2.56	.54	1.43	.30	.78	.16
968	do	♀	Washington	4.68	1.00	4.66	.99	2.60	.55	1.43	.30	.72	.15
974	do	♂	do	4.66	1.00	4.55	.97	2.53	.54	1.42	.30	.77	.16
845	do		Carlisle, Pa.; young teeth not all shed.	4.48	1.00	4.32	.96	2.37	.52	1.45	.32	.76	.16
671	do		White Sulphur, Va.; very old.	4.72	1.00	4.60	.97	2.65	.56	1.41	.29	.78	.16
1175	do		Rio Grande, Texas	4.59	1.00	4.47	.97	2.57	.56	1.37	.30	.70	.15
1184	<i>Vulpes littoralis</i>		San Miguel, (adult)....	3.86	1.00			2.07	.53	1.19	.30	.61	.15

TABLE B.—Detailed measurements in full of one typical skull each of five species of American and European foxes.

	Vulp. macrourus. ♀, 1325.		V. fulvus. ♂, Carlisle, 678.		V. vulgaris. 868, Nurnberg.		V. lagopus. 1040, Lapland.		V. velox. 1345, ♂.	
	Inches.	100ths total length.	Inches.	100ths total length.	Inches.	100ths total length.	Inches.	100ths total length.	Inches.	100ths total length.
Total length.....	5.70	1.00	5.56	1.00	5.57	1.00	5.17	1.00	4.46	1.00
Intermaxillary to condyle	5.60	.98	5.43	.97	5.37	.96	5.05	.97	4.44	.99
Greatest width	2.82	.49	2.92	.52	3.12	.56	2.80	.54	2.46	.55
Height above basi-occipital	1.60	.28	1.55	.27	1.62	.29	1.59	.30	1.35	.30
Distance between orbits	1.00	.17	1.08	.19	1.11	.20	1.13	.21	.92	.20
Distance between points of orbital processes.	-----	1.00	1.42	-----	1.49	.26	1.41	.27	1.19	.26
Nasal bones, length	2.13	.37	2.21	.39	2.16	.38	1.81	.35	1.57	.35
Nasal bones, width before	.41	.07	.49	.09	.50	.09	.37	.07	.34	.07
Narrowest part of muzzle behind ca- nines.	.84	.14	.89	.16	.96	.17	.88	.17	.69	.15
Upper incisors, from front to molars..	.88	.15	.92	.17	.94	.61	.80	.15	.69	.15
Upper incisors, from front to hinder margin of palate.	3.00	.52	2.87	.51	2.91	.52	2.65	.51	2.42	.54
Upper incisors, width between ex- ternal edges.	.66	.12	.66	.11	.55	.09	-----	-----	.50	.11
Upper molars, length taken together..	2.20	.38	2.01	.36	1.96	.35	1.94	.37	1.76	.39
Upper molars, least distance between.	.56	.10	-----	-----	.63	.11	.57	.11	.46	.10
Intermaxillary to end of nasals.....	2.78	.49	2.70	.48	2.75	.49	2.36	.46	2.08	.46
Intermaxillary to commencement of orbit.	2.51	.44	2.42	.43	2.35	.42	2.28	.44	1.91	.42
From line connecting points of orbital processes to occiput.	2.70	.45	2.44	.43	2.53	.45	2.32	.45	2.04	.45
From do. to end of nasals	2.78	.49	2.75	.48	2.78	.49	2.50	.48	2.23	.50
From do. to end of intermaxillary	3.34	.58	3.38	.60	3.28	.58	3.07	.59	2.72	.61
Lower jaw, length, (exclusive incisors).	4.46	.78	4.02	.72	4.07	.73	3.80	.73	3.34	.74
Lower jaw, height.....	1.50	.26	1.48	.26	1.40	.25	1.36	.26	1.21	.27

VULPES FULVUS.

Common American Fox.

Variety A. FULVUS, Red Fox.

Canis fulvus, DESM. I, 1820, 203. (Based on the *Renard de Virginie* of Palisot de Beauvois, in Bull. Soc. Philom.)

"Cuv. Dict. des Sc. Nat. VIII, 568."

HARLAN, F. Am. 1825, 89.

GODMAN, Am. N. H. I, 286

GRIFF. Cuv. V, 1827, 150.

DOUGHTY'S Cab. N. H. I, 1830, 25; pl. iii. (Very poor figure.)

? *Vulpes fulvus*, RICH. F. B. A. I, 1829, 91.

FISCHER, Syn. 1829, 191.

DEKAY, N. Y. Zool. I, 1842, 44; pl. vii, f. 1

AUD. & BACH. N. A. Quad. II, 1851, 263; pl. lxxxvii.

Canis vulpes, var. *δ pennsylvanicus*, BODD. Elench. Anim. I, 1784, 96. (Pennsylvania Brant Fox of Pennant.)

Canis (Vulpes) vulgaris, var. *fulvus*, WAGNER, Suppl. Schreber, II, 1841, 413.

Var. B. DECUSSATUS, Cross Fox.

Canis decussatus, ("Geoffr. Mus. Par.") DESM. Mam. I, 1820, 203.

"SABINE in Franklin's Jour. 656."

HARLAN, F. Am. 1825, 88.

GRIFF. Cuv. V, 1827, 149.

Canis fulvus, var. *β decussatus*, RICH. F. B. A. I, 1829, 93.

"Gardens & Menag. Zool. Soc. I, 221."

WAGNER's Suppl. Schreb. II, 1841, 414.

Vulpes fulvus, var. *decussatus*, AUD. & BACH. N. A. Quad. I, 1849, 45.

Var. C. ARGENTATUS, Silver Fox, Black Fox.

Canis argentatus, SHAW, Gen. Zool. I, 1800, 325.

DESM. Mam. I, 1820, 203.

"SABINE in Franklin's Narr. 657."

HARLAN, F. A. 1825, 88.

GRIFF. Cuv. V, 1827, 148.

F. Cuv. Suppl. Buff. I, Mamm. 1831, 189.

Canis fulvus, var. *γ argentatus*, RICH. F. B. A. I, 1829, 94.

WAGNER, Suppl. Schreb. II, 1841, 414.

Vulpes fulvus, var. *argentatus*, AUD. & BACH. N. A. Quad. III, 1853, 70; pl. cxvi.

Renard argenté, ST. HIL. & Cuv. Hist. des Mamm. II, 1819. (Plate and text not paged.)

SP. CH.—Hair long, silky, and soft. Tail very full; composed of an under fur with long hairs distributed uniformly among it. Distance, in red variety, between hairs, $6\frac{1}{2}$ inches. Tail with a white tip; feet and ears black.

Variety *FULVUS*.—Reddish yellow; back behind, grizzled with grayish. Throat and narrow line on the belly, white. Ears behind and tips of caudal hairs, (except terminal brush,) black.

Variety *DECUSSATUS*.—Muzzle and under parts, with legs, black. Tail blacker than in the other variety. A dark band between the shoulders, crossed by another over the shoulders.

Variety *ARGENTATUS*.—Entirely black, except on the posterior part of the back, where the hairs are annulated with gray; this occasionally wanting. Tail tipped with white.

The body of this species appears fuller than that of the gray fox, (*Vulpes virginianus*), although this is owing chiefly to the longer fur. The muzzle, as in the foxes generally, is sharp and attenuated. The ears are large and pointed, exceeding in size those of the gray fox; they are densely coated on both sides with fine hair, longest and coarsest on the concavity of the ear, and wanting immediately about the meatus.

The legs are longer and larger than those of the gray fox. The under surfaces of the feet are densely coated with long soft hair, much fuller and closer than in the gray fox. There are four toes on the fore foot, with a concealed rudiment of a thumb, having a claw attached, and placed higher upon the foot; the hind leg has four toes only. There is a small naked pad under each toe and on the ball of the feet, making five for each foot; on the fore leg is an additional small pad, concealed by the fur, and placed under the wrist. The pads, generally, are decidedly smaller and more covered up by hair than in the gray fox, and sometimes almost entirely concealed.

The tail is very full and large, rather smaller at base, and towards the end tapering into a conical tip. Its structure is entirely different from that of the gray fox in being uniform throughout, the hairs standing out almost directly perpendicular to the vertebræ, with a slightly backward direction. There are long hairs interspersed among the softer fur, but these are scarcely different in diameter and character from the under fur. In *Vulpes virginianus*, on the contrary, there is a great predominance of stiff bristly hairs, concealing the under fur; and along the dorsal line of the tail these hairs are aggregated into a concealed mane, to the exclusion of the other fur. The general direction of the hairs on the tail is also backwards, and the tail itself is much less full and bushy.

The same difference of hair on the tail is seen on the rest of the body. There is a long silky hair forming the exterior coat, beneath which is the shorter under fur. This, however, is not entirely concealed, but appears occasionally between the other. In the gray fox, on the contrary, the long hair is stiff and close set, and covers the under fur entirely.

The long hairs on the back measure about two and a half inches; the longest ones of the tail 3 or $3\frac{1}{2}$.

This fox exhibits three distinct types of coloration, which will be separately described. In the first one, the prevailing color is a bright reddish chestnut; in the second, there is a dark cross on the back, the sides being yellowish; in the third, the colors are almost uniform black. These are known respectively as the red, cross, and black foxes.

Red variety.—The prevailing colors in this variety are a bright, clear, yellowish rufous, darkest on the fore part of the back and shoulders, where the color has a rich purplish tinge. The top of the head and the buttocks, including the posterior half of the back, are coarsely and conspicuously grizzled with pale reddish white, caused by broad subterminal annulations and tips of this color on the reddish hairs. On the rest of the body the colors are quite uniform. The under parts are much like the sides; there is a very narrow line of dull white on the belly, which posteriorly between the legs is more extended, and is seen on the inside of the thighs. The lower half of the face, the inside of the ears, the chin, throat and space between the fore legs are white, interrupted by a band of reddish on the hinder part of the throat, and an indistinct line of dusky down the centre of the chin. There is also a dusky shade along the tips and around the insertions of the whiskers. The convexity of the ears is entirely of a uniform glossy black, as are also the feet, from the carpal and tarsal joints, this same color extending up the fore arm and leg, especially on the outer surface. The posterior line of the feet, however, and the other portions of the legs not already mentioned, are of a chestnut red, slightly varied here and there.

The general color of the tail is a yellowish red, somewhat paler beneath, and with a whitish tip. Nearly all the hairs are, however, largely tipped with black, causing this color greatly to predominate.

As already stated, the long hairs of the body exhibit no sudden variations of color, except on the posterior half of the back, where the central portion is whitish, the tips being red, giving rise to a decided variegation of tint. Among the uniform hairs of the fore back and shoulders are some that are entirely black, but these are only discernable on close examination. The under fur along the back and upper part of the tail has a decided sooty tinge, which, however, gradually passes on the sides into a dull yellowish white, like sheeps' wool. The tips of the hairs of the under fur are colored to correspond with the region in which they occur.

There is a variety of the red fox sometimes called the Sampson fox, in which the long hairs

of the body and tail are entirely wanting, leaving the soft woolly fur entirely exposed. The general colors are similar to those of the ordinary variety, except that the red tints are lighter, and there is no grizzling on the hinder back. The sides are of a yellowish white, and there is no black on the tail. I am informed that in some sections of country this "Sampson fox" is not uncommon, particularly in northern Ohio, whence the specimen described was sent by Dr. Ackley. I have seen a similar condition of hair among skins of *Canis griseus* from Chile, and, in fact, in many other species.

The common red fox of America was, for a considerable time, supposed to be the same with the red fox of Europe, (*Vulpes vulgaris*.) Careful comparisons of the two show, however, appreciable differences, although the resemblance is very close in external appearance and scarcely to be expressed except comparatively. A very decided difference is seen in the texture of the fur, which, in the American fox, is much longer, softer, and silkier, the long hairs of the European fox resembling, in fact, rather more nearly those of the gray fox. The tail, also, in the European fox is much less bushy, and tapers to the tip from near the base, instead of being of uniform diameter for more than half its length. The longest hairs of the tail scarcely exceed two inches in length, instead of three, as in the American red fox.

The muzzle of the European fox is longer than in the American species, and the eyes considerably farther apart, a quarter of an inch at least. The concavity of the ear around the meatus is less provided with long hairs, the nearly naked portion extending to within half an inch (or less) of the margin. The feet are more slender, and the close pressed velvety hairs on the inner surfaces and between the toes are much shorter, and allowing thereby the claws and pads to be more distinctly visible.

The red color of the European red fox (*Vulpes vulgaris*) is a good deal darker than in our species, and the tint uniform over a greater extent; there is little of the golden hue which gives so much beauty to the American animal. The space where the whiskers are inserted is white, instead of dusky, giving rise to a very conspicuous white patch on the side of the muzzle. There is a good deal more white on the throat and belly, and there is no trace of the narrow reddish collar on the former. The feet, instead of being of a deep and uniform black, are only tinged with this color, and there is almost none of it above the carpal and tarsal points. It is possible, however, that other specimens may show a greater amount of black.

Wagner refuses to admit the distinction of species here referred to, and insists that the differences are owing to the latitude, his examination of the American fox being based on descriptions and skins from very northern localities. Specimens from the southern States, however, vary in a similar manner, as above described, from the European fox, and there is never any difficulty in separating skins of the two kinds by their external appearance when mixed with each other. The particular European skin serving for comparison in the present case is an old female (No. 774) killed in Scotland in February, 1855.

In another article I describe as distinct the large fox with bushy tail, of the Rocky mountain region, although no very tangible characters can be given as distinctive. Among the numerous skins of foxes collected in Oregon by Dr. Suckley, I find what may be referred to both species as regards size, and both kinds may possibly occur. These specimens are, unfortunately, hunters' skins only. All are more or less mutilated and without the skull. I cannot, therefore, speak positively as to the existence of the true *Vulpes fulvus* beyond the Rocky mountains, and must wait for further material. The small skins differ from the eastern in being of finer fur and having more white beneath, the centre of the belly and throat being entirely white.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
962	2005	♂	Middleboro, Mass.-----	Nov., 1855	J. W. P. Jenks.-----	Skin. -----
269	1212	-----	Cleveland, Ohio -----	Mar., 1854	Dr. Ackley -----	do -----
1409	2256	-----	Elizabethtown, N. Y.-----	-----	Dr. S. E. Hale -----	do -----
1430	2293	○	Middleboro, Mass.-----	-----	J. W. P. Jenks.-----	do -----
2041	3086	-----	Washington, D. C.-----	-----	Dr. Nichols.-----	Head -----

The cross fox is the second marked variety of the red fox of the United States, so called from the presence of a black cross, formed by a dark band along the back, crossed by another on the shoulder. This variety is seldom seen as far south as Pennsylvania, but in northern New York it is not uncommon. In general form it resembles the red variety closely, but is perhaps a little larger, with more bushy tail. The under surfaces of the feet likewise are more densely covered with woolly hair. There is a good deal of yellowish rufous visible on the back and sides, which is quite vivid on the flanks and side of the neck. The upper part of the head, (exclusive of muzzle,) the posterior half of the back, with the outside of the shoulders and thighs, have the basal fur a dusky-brown, darkest on the median line, the long hairs black, with a broad subterminal annulation of yellowish white of a much grayer tint on the head and shoulders, which variegates the color very much. The dorsal region between the shoulders is also similarly marked; but a great preponderance of black almost obscures the lighter colors, and with a similar proportion of black evident at the upper part of the shoulders, causes the appearance of a black cross at this point. The sides of the neck and of the body are pure reddish yellow, the basal fur being nearly white. This color extends towards the median line of the back, just behind the shoulders, leaving an interval of only a few inches on the middle of the back, and relieving very much the posterior angles of the cross. The muzzle, legs, and under parts generally, including the inside of the limbs, with the convexity of the ears, are black. The long tail-hairs are grayish or yellowish red, and black at their tips, impressing this color on the exterior of the tail; the tip of the tail, however, is entirely white.

In several specimens of cross foxes from Fort Dalles, I can see no difference from the one described above from Ogdensburg, except that the tail is a little longer and fuller. In one there is only a more reddish tinge in the light spaces on the sides. These may possibly belong to *V. macrourus*.

List of specimens.

Catalogue number.	Locality.	When collected.	Whence obtained.	Original number.
79	Ogdensburg, N. Y.-----	-----	W. E. Guest.-----	-----
1019	Fort Dalles, O. T.-----	Jan., 1855	Dr. George Suckley.-----	57
1020	do.-----	do.-----	do.-----	58

Black Fox.—The color here is a uniform lustrous black, with a distinct white tip to the tail. On the top and sides of the head, however, and on the posterior half of the back, including the outside of the thighs, the long hairs are grayish-silvery at the end, (the extreme tips black,) grizzling the back very conspicuously. The same feature is observable at the base of the tail and to some distance on its sides; it is also seen slightly on the shoulders. The under fur is of a sooty color, not very dark, however, and becoming lighter on the sides of the neck and flanks.

List of specimens.

Catalogue number.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
1000	-----	Fort Dalles, Oregon-----	April, 1855	Dr. George Suckley-----	67	Skin.
1001	-----	do-----	Jan. 1855	do-----	41	do-----
1190	o	Des Chutes Valley-----	1855	Lt. Williamson, collected by Dr. J. S. Newberry.	-----	-----

In the only one of the above specimens (1190) in which the feet are entire, the soles are much less densely furred than in the cross foxes, and more nearly resembling the red fox of the eastern States in this respect. It is by no means certain that these specimens are not black varieties of the *Vulpes macrourus*.

Measurements of specimens of different varieties.

Current number.	Nose to root of tail.	Tail to end of vertebræ.	Tail to end of hairs.	Width of hairs.	Ears posteriorly.
RED.	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
962	24	12½	17	6½	-----
1388	28	13½	15 +	-----	-----
459 ¹	25	-----	18	6	-----
458 ¹	24	-----	16	6½	-----
457 ¹	28?	-----	17½	6½	-----
CROSS.					
79	30	14	16	6½	-----
1019	26	-----	17	-----	-----
1020	26	17	20½	-----	-----
BLACK.					
1000	24	16	19	8	-----
1001	29?	14	17	8	-----
1190	24	14½	17	7	4

¹ Catalogued under the head of *Vulpes macrourus*.

The skull of the red fox has the usual physiognomy of the American *Canidae*, and in fact is a miniature of that of the prairie wolf, from which it differs by characters hereafter to be pointed out. The resemblance to the skull of the gray foxes is much more remote. The upper profile undulates considerably; the occipital outline is nearly perpendicular, but overhung by the occipital crest. The outline ascends rapidly from this point to above the meatus, where rounding over it slopes gently in nearly a straight line to a little beyond the post-orbital processes of the frontal bone, with a slight depression anterior to the temporo-frontal suture, and opposite the point of the post-orbital processes. The outline then curves rapidly downwards (convexly) to the point of the intermaxillary bone, then passes abruptly more horizontally to the anterior extremity of the nasals, the outline at the same time being quite convex.

The temporal crests are not always united into one at the posterior portion of the parietal outline, and usually in the centre of an interparietal, which runs forward for a considerable distance, or about two-fifths of the length of the parietal; at this point they diverge in a very narrow lyre, approximating on the coronal suture, where they again diverge and pass forwards, continuous with the posterior edge of the post-orbital process. In old specimens the median sagittal or temporal crest extends to the coronal suture, when it diverges to the post-orbital processes as stated. There is a depression in the longitudinal line of the skull from between the points of the post-orbital processes to the middle of the nasals, and in a less degree to the end of these bones. There is also a considerable longitudinal swelling in the frontal bone on either side of this furrow.

In the very great similarity in form of the skulls of the genus *Vulpes*, it is very difficult to assign any absolute characters which shall define the species with precision. Certain comparisons with each other may, however, be made as serving to fix their distinctive features. Thus, the American red fox differs from that of the European *Vulpes vulgaris* (comparing eight of the one with five of the other) by a conspicuously more slender head and muzzle and less massiveness of form. This will be at once shown by the table of measurements given previously. The muzzle is decidedly longer as well as more slender. The orbital processes are further back from the muzzle, and the distance from the posterior lower molar to the posterior portion of the condyle less. The palato-maxillary suture is not so far forward.

The excess in length of the muzzle of the American red fox lies perhaps chiefly in the intermaxillary, which projects further forward than in the European species, and has a wider gap between the incisors and the canines.

The skull of the arctic fox, *Vulpes lagopus*, is shaped a good deal like that of the American red fox. It is somewhat smaller, however, and the muzzle more thickened at the base, and is much less contracted opposite the middle of the nasal bones, besides being considerably thicker at the end. The muzzle is much deeper, and its upper outline more horizontal; the intermaxillary shorter in front of the canines, and its free margin much more nearly in a vertical line. The zygomatic arch is much higher and more curved, more deeply scooped out above in the orbital portion, and is narrowest opposite the middle of the molar, or on the middle of the anterior part of the arch instead of on the posterior portion just anterior to the glenoid cavity.

There is no very striking difference in the teeth, except perhaps that the first tubercular upper molar (first true molar) in the Arctic fox is a little more deeply excavated, and the depressed ridge extending from the anterior internal tubercle to the low tubercle inside of the base of the posterior external tubercle is broken down.

The differences between the skulls of *Vulpes fulvus* and *macrourus* will be more particularly

pointed out in the article on the last mentioned species. I will only state that the muzzle of the latter is considerably longer and more slender, exceeding in this respect any species with which I am acquainted.

It is not a little remarkable that there have as yet been no remains of the red fox detected among the fossils derived from the Carlisle and other bone caves. The gray fox is abundantly represented, but not a trace of the other. This would almost give color to the impression somewhat prevalent that the red fox of Eastern America is the descendant of individuals of the European red fox imported many years ago, and allowed to run wild and overspread the country. The fact of their present abundance and extent of distribution is no barrier to the reception of this idea, as the same has been the case with horses brought over by the Spaniards, after the discovery of America, and set at liberty. As is well known, the immense herds of these animals in Mexico, Texas, and the western plains, are the lineal descendants of the imported horse. Nor is there any serious difficulty to be met with in the different characteristics of the American animal as the finer fur, brighter color, narrower and more delicate head, sharper muzzle, &c., as it is in precisely such osteological peculiarities that the Anglo-American race differs from its English stock.

VULPES MACROURUS, Baird.

Prairie Fox.

Vulpes macrourus, BAIRD, in Stansbury's Exploration Great Salt Lake, (published June, 1852,) 309.

Vulpes utah, AUD. & BACH., Pr. A. N. Sc. Ph. V, for June 30, 1852, (published July, 1852,) 114.—IN. N. Am.

Quad. III, 1853, 255; pl. cli.

? *Vulpes fulvus*, MAXIM. Reise, II, 1841, 98.

SP. CH.—In size, length of fur and tail, exceeding the *Vulpes fulvus*. Tail vertebræ, usually 18 inches in length; breadth between lateral hairs eight to nine inches. Colors of the light variety, similar to those of the red fox, but yellower, and with more white beneath.

This magnificent fox, the finest species known, is an inhabitant of the central portions of North America, and is eminently remarkable for the beauty and excellence of its fur. Very similar, in general appearance, to the common red fox; its superiority in size will at once readily distinguish it. It appears to run into the same varieties as our red fox, and that of Europe, although I have never seen a black skin. Several fine cross foxes, however, of this species have been received among the various government collections.

Owing to the close resemblance to the common red fox, it is difficult to describe the prairie fox intelligibly, except by comparison with the other species. As already stated, it is considerably larger, the tail particularly so. The ears are very large, and quite acutely pointed, in both respects exceeding the red fox. Their concavity seems less beset with hair, although the bristly hairs anterior to the meatus are very long. The eyes are only about an inch and a quarter apart, nearer, in fact, than in the red fox. The feet are large and stout, and in the only perfect specimen before me, a cross fox, (No. 24,) their soles are covered with a long dense wool, completely concealing the pads, which are reduced to quite small dimensions, but not overgrown with hair. This development of wool on the feet is, however, seen in the cross fox belonging to the common species.

The tail is very full and densely hairy; it is long, though perhaps not exceeding that of the red fox in proportion. When the lateral hairs of opposite sides are extended, the distance between their tips measures from seven and a half to eight and a half inches, instead of the six or seven and a half, as in the common red fox. The longest hairs measure about four inches. The longest hairs of the back and sides exceed four inches in length.

The colors of this species are very similar to those of the corresponding varieties of the red fox. In the light variety the prevailing tint is rather a pale ochre yellow than a red, whence the species might with great propriety be called the yellow fox. The yellow is brightest anteriorly on the sides; there is, however, a wash of reddish along the dorsal line. The hinder part of the back is variegated with yellowish white, this color annulating the long hairs, which are otherwise black at the base and rufous at tip. The under fur is everywhere plumbeous at base, and of a chestnut color terminally along the dorsal line, changing through ochre yellow to yellowish white on the sides. There is, however, a darker yellowish cross on the shoulders, separating the yellowish white of the side of body and neck. The upper part of the head is grizzled like the lower part of the back. The throat, chest, and under parts generally, including the whole belly and inside of legs and thighs are of a clear, yellowish-white, without any red, the plumbeous base of the wool showing occasionally through. The amount of white is thus greater than in the red fox. The base of the ears is yellow; the greater portion, however, of their convexity is uniform black. The tail is of a duller yellow than the body, lighter on the sides, the long hairs tipped with black, clouding the tail with this color; the tip of the tail is entirely yellowish-white. The fore feet are black; on the hind feet, however, this color only extends in a narrow line on the anterior face.

The following table of measurements can be only considered as approximate, as the specimens are all hunters' skins, and do not preserve their original proportions.

Measurements.

	A.	No. 23.	No. 1006.	No. 1007.	No. 24.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
Nose to tip of tail.....	33	31	33	30	32
Tail to end of vertebræ.....	18	16	-----	15½	14+
Tail to end of hairs.....	22	20	18+	19½	17+
Breadth of tail.....	9	8½	8½	8	8½

The fresh measurement of No. 1007 gives two feet as the total length; the others are the same as in the dried skin. I have, however, given the present length as skin for the purpose of more readily making the comparison. Number 24 is a cross fox, the others are red foxes.

The specimen No. A is in the collection of Captain Stansbury, now deposited in the Patent Office, and served as the basis of the description of the species in Captain Stansbury's report. This report was published in May, 1852, and extra copies of the zoological portion were distributed as a separate work in June, 1852, and bearing this date. On almost the last day of June, a notice of this same species, under the name of *Vulpes utah*, was presented to the Academy of Natural Sciences, and published about the middle of July, more than a month

subsequent to the date when the copies of Stansbury's report and the separately printed zoology were distributed. The priority of publication is thus clearly with the name of *Vulpes macrourus*, which must consequently be retained.

In this specimen, (variety *decussatus*,) the muzzle, legs, entire under parts, including inside of limbs, and the convexity of the ear are of a sooty black. The dorsal region, extending from the crown of the head to the middle of the back, with branches over the shoulders, are also sooty brown, including the basal fur; the long hairs, however, show near their tips a space of yellowish, which takes somewhat from the uniformity of color; the proportion of yellowish on the hinder part of the back is still greater, and, in fact, rather exceeds the black, and produces a strongly grizzled appearance. The sides of the neck and of the body behind the shoulders (where the color extends high up) are of a buff yellow, the basal fur still lighter exteriorly, though dusky at the base. The tail exhibits a mixture of black and yellowish, the hairs being dusky at base, then yellowish, and with dark brown tips; the sides and under surface of the tail show most yellow. The extreme tip of the tail is white.

The black of the upper parts of the legs and muzzle is not pure, but slightly grizzled with grayish. The wooly hairs on the soles of the feet are yellowish white.

Several skins of red foxes, (457, 458, 459, 1018,) brought by Dr. Suckley from Oregon, although smaller than those described above, may yet be considered as identical, on account of the finer fur and more yellow color. These specimens, unfortunately, are mere hunters' skins, unaccompanied by skulls, and lack data for more precise determinations. I shall, however, for the present, retain them provisionally under *V. macrourus*. Lewis and Clark, however, refer to the red fox of the coast region of Oregon as identical with that of the eastern States, and both as distinct from the large fox of the plains.

The most prominent peculiarity the skull of this fox is the elongated and slender muzzle, which exceeds the common red fox as much as the latter does the European *Vulpes vulgaris*. This is abundantly shown by the table of measurements given under the general head of the sub-family, by which it will be seen that the skull is absolutely longer and more slender than any one measured, either European or American.

Dimensions of No. 24.

	Feet.	Inches.
Snout to base of tail.....	2	8
Tail to end of vertebræ, (part lost)		14
Tail to end of hairs, (part lost).....		17
Breadth of tail, hairs extended laterally.....		8½

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n.	Collected by
23	-----	-----	Great Salt Lake	-----	Capt. Stansbury	-----	Red fox	-----
1006	-----	-----	Fort Dalles, O. T.	Jan. 1855	Dr. Suckley	40	do	-----
1007	2014	♂	do	Feb. 1, 1855	do	43	do	-----
1018	-----	-----	do	-----	do	56	do	-----
459	-----	-----	Fort Boise, O. T.	-----	do	-----	do	-----
458	-----	-----	do	-----	do	-----	do	-----
457	-----	-----	do	-----	do	25	do	-----
1788	-----	-----	Fort Union, Neb.	-----	Lt. G. K. Warren	-----	do	Dr. F. V. Hayden.
1789	-----	-----	do	-----	do	-----	do	do
1790	-----	-----	do	-----	do	-----	do	do
1828	-----	-----	Fort Pierre, Neb.	-----	do	-----	do	do
24	-----	-----	Fort Laramie	-----	Col. S. Cooper	-----	Cross fox	-----
A	-----	-----	Salt Lake	-----	Capt. Stansbury	-----	do	-----

VULPES VELOX.

Kit Fox. Swift Fox.

Canis velox, SAY, in Long's Exped. R. Mts. I, 1823, 487.

HARLAN, F. Am. 1825, 91.

GODMAN, N. H. I, 282.

MAX. Reise Nord-Amerika, II, 1841, 44, 256.

Vulpes velox, AUD. & BACH. N. A. Quad. II, 1851, 13; pl. lii.

Canis cinereo-argentatus, "SABINE, in Franklin's Jour. 658."

Canis (Vulpes) cinereo-argentatus, RICH. F. B. A. I, 1829, 98.

Canis microtus, "REICHENBACH, Regnum Animale, I, 10, figs. 72, 73," as quoted by WAGNER in Wiegmann's Archiv, III, 1837, II, 162.

REICHENBACH, Universum des Thierreiches, I, 1846, 43.

IB. Raubsäugt. 1852, 100, figs. 72, 73. (Kit Fox of Leipsic fur traders.)

Kit Fox, LEWIS & CLARK.

SP. CH.—Smaller than red fox. Head short, broad. Ears small. Legs short. Tail very dense, cylindrical, and bushy; about half as long as the body and head. General color above, including ears and tail, yellowish gray; on the back conspicuously grizzled. Sides and portions of the legs pale reddish yellow; rest of legs and beneath, whitish. Tail tipped with black. No black on the ears.

This small fox is considerably less in size than the red or gray fox, and differs from both so strongly as to be at once recognizable among the American species. The under fur is remarkably full and dense, much more so than in the red fox, and the interspersed longer hairs exceed in length the under fur so little as to permit it to be readily seen. The limbs are rather short but stout, the feet shorter and the body lower than in the red fox. There are the usual naked callosities on the feet, as in foxes generally. The soles are, however, so densely covered with long woolly hairs, as to conceal them from view. The fore claws appear rather sharper and more curved than those of the red fox. The head is considerably shorter and broader than in the red fox. The ears are very much smaller; they are thick and densely coated with hair on both sides, except around the meatus.

The tail is rather short in its proportions, scarcely more than half as long as the head and body. It is, however, remarkably dense and bushy, being made up principally of under fur, instead of having its contour determined by the long hairs. It is nearly cylindrical, or slightly depressed, with a truncate and rounded tip, and is slightly contracted at the base.

There are no strongly marked contrasts of color in this diminutive fox. The entire upper parts and sides extending low down on the thighs and shoulders, are conspicuously grizzled with pale grayish white and brownish yellow, mixed with a little dark brown or black. The under fur in these regions is light plumbeous at base, and light brownish chocolate yellow at tip; these tints becoming paler towards the sides. The long stiffer hairs are dark brown, (more reddish at the extreme tip,) and broadly annulated near the tip with yellowish grey white; there is, however, an occasional hair that is entirely black. The under fur on the top of the head has more reddish on the terminal portion. The under parts, generally, for their entire width, as well as the inside of the limbs, are yellowish white. On the sides of the neck and body, extending some distance up behind the shoulders, the hairs are of a pale reddish yellow, without annulation, this color also tinging strongly the fore arm and posterior face of the hind leg; the rest of the legs, except as described, is of a pale brownish white. There is a dusky tinge around the lips, and a patch of the same between the eye and the nose, above the insertion of the whiskers, which are themselves black. The ears are uniform brownish yellow on their convexity; anteriorly yellowish white.

The tail, in general tint, resembles the back, except that there is no distinct annulation, the prevailing hue being a yellowish gray. There is a considerable amount of black on the tips of the hairs, but this is much less conspicuous than in the red and gray foxes. There is most black at the truncate tip. There is nothing corresponding to the white tuft of the red fox. The under surface of the tail is tinged with yellowish red.

The specimen described above is in very full fur, having probably been taken in the depths of a Fort Union winter. The colors differ slightly from those given by some other authors, owing possibly to season; and the animal itself appears to have been of unusually large size, and very old, judging by a comparison of its skull with a considerable number of separate skulls sent by Dr. Hammond from Fort Kearny. Its distinctive features are so striking as to render it quite unnecessary to compare it with other American foxes; according to Richardson, its nearest relative is the *Canis corsac* of Siberia. It comes nearer in appearance to the gray fox than the red; it lacks, however, the bright chestnut of the ears and sides of the neck, the black muzzle, the predominant badger gray and black of the back, the well defined black dorsal stripes and tip to the tail, which, in the swift fox, besides, is very much denser, fuller, more truncate, and without the concealed mane of stiff hairs in the upper surface of the tail. The skulls of the two animals are widely different.

Measurements of No. 59.

	Inches.
Length from nose to tail	24
Tail to end of vertebrae	9
Tail to end of hairs	10½
Width of tail flattened horizontally	6
Height of ear above notch	1½

There are some points of resemblance between this fox and the *Vulpes lagopus* in size, shape of skull and tail. The difference of color between the grizzled yellowish gray of the one, and the pure white or sooty gray of the other, will always distinguish them. *Canis griseus* of Chile is of about the same size, but has a more wolf-like tail. The skull is very different, the animal belonging to the subgenus *Lycalopex*, (now *Pseudolopex*), of Burmeister.

The relationship of this species to the *Canis corsac* is very close, as, without specimens of the latter, I am unable to find in descriptions any trenchant distinctive features.

Summer specimens of this fox, received since the preceding description was prepared, differ very materially from the winter dress. The size is considerably smaller; the fur much shorter on all parts of the body; the tail is full, cylindrical, constricted at the base, and obtusely pointed at the tip. The feet are quite thinly haired. There are small naked pads under all the toes, and a V-shaped one under the palm. There is no entirely naked ball under the metatarsus, the one sometimes found there being overgrown with short hairs.

There is decidedly more of a reddish tint in these specimens, replacing the yellowish of the other, including the basal of the back and sides. The under surface of the tail is cinnamon-colored, darkest towards the extremity. The tip of the tail is decidedly and conspicuously black, without any white hairs. The size of the two specimens is about the same, 1827 rather larger, fuller, and more cinnamon in tint.

The skull of the little prairie fox exhibits a very close resemblance to that of the red fox, although much smaller. The upper outline is almost precisely the same, perhaps more convex about the meatus. The temporal crests in seven skulls before me do not approach each so much as in the red fox, the shape (lyre-form) and distance of the ridges more like what is seen in the gray fox, although otherwise this is a very different animal. The post-orbital processes of the frontal bone are rather short, and are more obtuse than in the red fox. The temporal fossæ are considerably larger in proportion, and the distance between the zygomata wider. The sides of the skull at the temples are considerably more convex. The forehead is rather flatter. The orbital process is further back. The lower jaw is very similar in shape to that of the red fox, although its lower outline is more curved.

The dentition is almost exactly that of the red fox, the differences being with difficulty expressible by description. There is but a single trihedral tubercle on the posterior lower molar. The lower canines are shorter, broader at base, more curved, and the angle nearer the middle of the exposed portion than in the red fox, in which the bend is nearer the base.

The skull of this species is considerably smaller than that of the Arctic fox, *Vulpes lagopus*, the muzzle is much slenderer and the outline of the sides more concave. The anterior half of the zygoma is broader than the posterior, instead of narrower, as in the Arctic fox. The upper branch of the anterior root of the zygomatic arch is much more horizontal. The muzzle, also, is not so high, and the free edge of the intermaxillary is more oblique.

I am inclined to think that at no age are the temporal crests of *Vulpes velox* ever united into one beyond the termination of the interparietal bone. In a specimen having every appearance of extreme age, these ridges are half an inch apart at the coronal suture.

The resemblance of the skull of *Vulpes velox* to that of *Canis corsac*, as figured by Blainville, is exceedingly close. The size is precisely the same, and all the details appear almost identical. The only appreciable difference is that in *C. corsac*, the inferior or posterior fork of the anterior root of the zygomatic arch does not project forward at all, the outline of contact with the maxillary being an obtuse angle, instead of a narrow loop bent round with the branches beyond

the curve, nearly parallel to each other. The distance from the orbit to the ante-orbital foramen is less, and the ante-orbital portion of the molar occupies nearly half the interval, instead of about one-fourth. The upper outline of the muzzle is less deeply indented on the middle of the nasals. The coronoid process is not so high, and its posterior outline is not hook-shaped and curving backwards, as in *V. velox*. These differences, however, after all, are not greater than may sometimes be seen in skulls of the same species, and it would not surprise me at all to ascertain, by careful comparison of skulls and skins of both animals, that *Vulpes velox* and *corsac* were one and the same species. The skulls of the two certainly resemble each other more closely than those of the American and European red foxes.

The following description by Maximilian, of the Swift fox, in the *Reise in das Innere Nord-Amerika*, II, 1841-'44, taken from fresh specimens, will serve to throw light upon the history of the animal.

Canis velox.—This species, scarcely half the size of the European fox, is shaped somewhat like it. The body is slender, as is also the head; the snout is pointed; the ear is large, pointed above, coated internally with whitish hairs. The eye is greenish-gray, with darker pupil. The color of whole upper parts and sides is a pleasant pale reddish-yellow, the hairs themselves being reddish-yellow at the roots, reddish-white at the tips, and marked subterminally with a little darker reddish gray-brown. The tail is colored like the body, its tip, however, black. The color of the forehead and upper part of the head is a little darker than that of the back, appearing slightly mixed with grayish-brown; sides of the snout along the upper jaw, to the eye, blackish, the arch of the nose with a yellowish-red tinge; lower jaw and all under parts, as also the anterior face of the hind legs, whitish. In winter the animal is more of a pale grayish-brown, washed with brighter; all the hairs with decided white tips.

Measurements.

	Feet.	Inches.	Lines.
Total length.....	2	8	7
Tail to tip of hairs.....		12	
Tail to end of vertebræ.....		10	2
From tip of nose to anterior canthus.....		2	
Length of orbital opening.....			8
Length from posterior canthus to the anterior base of the ear.....		1	7
Height of external ear.....		2	1
Width of external ear at base.....		1	6
Length of whole head.....		4	8

The stomach is considerably curved; it was commonly full of fragments of skin, leather with hair, berries, remnants of mice, and grasshoppers, upon which the foxes of the prairies are necessitated to live on in great measure. The liver appears to be divided into seven greater and smaller folds; in the penis of the male is a bone 1 inch $7\frac{1}{8}$ lines long, shaped much like that of the wolf.

The female brings forth from four to eight young, in holes, in March or April.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.	Collected by
59	951	---	Fort Union, Nebraska	Winter	Alex. Culbertson	---	Skin	---	---
1827	---	---	Fort Berthold, Nebraska	Summer	Lt. G. K. Warren, U. S. A.	---	do	---	Dr. F. V. Hayden.
1871	2569	♂	Bridgers' Pass, Rock ymts.	Aug. 14, '56	Lt. F. T. Bryan, U. S. A.	261	do	6. 20. 12. 13½	W. S. Wood

VULPES LAGOPUS.

Arctic Fox.

Canis lagopus, LINN. Syst. Nat. 1766, 59.

SCHREBER, Säugt. III, 1778, 362; tab. xciii, xciii*.

"SABINE, Suppl. Parry's First Voyage, 187."

HARLAN, F. Am. 1825, 92.

"GODMAN, Am. Nat. Hist. I, 268."

GRIFF. Cuv. V, 1827, 148.

"THIENEMANN, Naturh. Bomerh, I."

WAGNER, Suppl. Schreber, II, 1841, 426.

Canis (Vulpes) lagopus, RICH. F. B. A. I, 1829, 83.—*ib.* var. *β fuliginosus*, I, 1829, 89.

Vulpes lagopus, AUD. & BACH. N. A. Quad. III, 1853, 89; pl. cxxi.

Canis isatis, GM. Nov. Comment. Petrop. V, 1760, 358.

SP. CH.—Smaller than the American red fox. Tail very full and bushy. Soles of feet densely furred. Color white in the adult; grayish lead color in the young.

Without any good specimens of this species before me, excepting European ones, I shall not go into a critical description of the species, nor attempt to discuss the question whether the "blue" arctic fox be distinct from the white, or only a different condition of age. The arctic fox is confined to the arctic regions of the globe, and has never yet been found within the limits of the United States.

According to Audubon and Bachman they are occasionally found in the northern parts of Newfoundland, about latitude 52°, and become more and more abundant as far north as travellers have penetrated.

VULPES (UROCYON) VIRGINIANUS.

Gray Fox.

Canis virginianus, ERXLEBEN, Systema Regni-Animalis, 1777, 567 (from Catesby).

SCHREBER, Säugt. III, 1778, 361; pl. xcii, (*Virginische Fuchs*—very poor fig. in text)

Gm. Syst. Nat. I, 1788, 74.

SHAW, Gen. Zool. I, 1800, 325, (from Catesby.)

HARLAN, F. Am. 1825, 89.

GRIFF. Cuv. V, 1827, 150.

Canis (Vulpes) virginianus, RICH. F. B. A. I, 1829, 96.

Vulpes virginianus, DEKAY, N. Y. Zool. I, 1842, 45; pl. vii, f. 2.

AUD. & BACH. N. A. Quad I, 1849, 162; pl. xxi.

Canis cinereo-argentatus, ERXLEBEN, Syst. An. 1777, 576.

SCHREBER, Säugt. III, 1778, 360; pl. xcii. (*Gris Fuchs* in text.)

Gm. Syst. Nat. I, 1788, 74.

SHAW, Gen. Zool. I, 1800, 324, (from Schreber.)

DESMAREST, Mamr. I, 1820, 204, (mixed with other species.)

HARLAN, F. Am. 1825, 90.

GRIFF. Cuv. V, 1827, 148.

GODMAN, Am. N. H. I, 280.

F. Cuv. Suppl. Buffon, Mam. I, 1831, 187.

DOUGHTY, Cab. N. H. II, 1832, 145; pl. xiv.

WAGNER, Suppl. Schreb. II, 1841, 436. Applies partly to *Vulpes velox*.

Canis griseus, BODDAERT, Elenchus Anim. I, 1784, 97. (*Gray Fox* of Pennant.)

Gray Fox, CATESBY's Carolina, II, 1731, 78; pl. lxxviii, (very bad figure.)

PENNANT, Syn. Quad. 1776, 157, (from Catesby.)—IB. Hist. Quad. 1781, No. 160.—IB. Arctic Zoology, I, 1784, 48.

? *Corsak Fox*, PENN. Hist. Quad. 1781, 235.—IB. Arctic Zool. I, 1784, 47. (Based on a drawing, by Taylor White, of an animal from North America, possibly of this species.)

Renard tricolor, St. Hilaire & Cuv. Hist. des Mammif. II, 1819; plate.

SP. CH.—Head and body a little over two feet in length. Tail rather more than half as long. Tail with a concealed mane of stiff bristly hairs. Prevailing color mixed hoary and black; convexity and base of ears, sides of neck, edge of belly, and considerable portion of fore legs rusty or cinnamon. Band encircling the muzzle, much dilated on the chin, black. Throat and lower half of face pure white. Tail hoary on the sides; a distinct stripe above and the tip black; rusty beneath.

In the absence of fresh specimens I am unable to give any accurate account of the form of the gray fox, although the body is decidedly stouter and the head shorter and broader than in the red foxes. The hair is of two kinds, a soft waved under fur, completely concealed from view by rather stiff and coarse long hair. The ears are high and somewhat pointed, covered densely with hair, except immediately around the meatus. The legs appear rather short. There are four toes on the fore foot on one plane, and a rudimentary thumb, armed with a sharp claw, about an inch higher up. There are but four toes on the hind feet. There are five naked callosities or pads on each foot, one under each toe, and one under the ball. On the fore foot is an additional callosity of small size under the carpus. The tail is large and bushy, and with the hairs, is about as long as the trunk, exclusive of head and neck. Some specimens would seem to indicate that the tail is longer in the male than in the female. There is a tendency to a compression of the tail instead of its being uniformly bushy all round. As in the body, there is a softer wool between the long hairs of the tail, except along the upper surface, where stiff hairs prevail exclusively, forming a kind of mane.

The prevailing color of the upper parts and sides of body and limbs is a mixed silver gray, or hoary and black, something like the badger, but with more black. The proportion of black predominates towards the dorsal region, without being collected into a band. The base of the ears and a decided tinge on their convexity, the sides of the neck with a narrow, interrupted collar on the lower throat, the posterior and interior surface of the fore legs, and a broad edge to the belly, are of a chestnut brown or cinnamon color, darkest on the legs and paler on the sides of the belly. There is no mixture of black or hoary on the sides of the neck. The interior of the fore legs is not colored uniformly, some portions being quite whitish. A somewhat similar condition is seen on the hind legs, where, however, the cinnamon tinge is much paler, and mixed with dusky. The tail above is hoary and black like the back, entirely black along the median line and towards the tip, where the color is uniform. There is also a very considerable amount of black tips on the sides of the tail. The under surface of the tail is light chestnut, without any mixture of black.

The under parts of the body, although whitish, have a very decided tinge of cinnamon. The inferior half of the head and the throat are pure white; the margins of the lips, the chin, and a patch on the side of the muzzle midway between the snout and eye being, however, brownish black, relieved by white tips to some of the hairs. The extreme tip of chin and of sides of muzzle are, however, dull white. The white on the side of the head is strongly marked and of well defined outline, passing about the breadth of the orbit beneath the eye. In this white is a small dusky spot behind the angle of the jaw, where some bristles are inserted.

The long hairs of the back, considered separately, are about two inches in length, and mostly black; hoary white at the base, and annulated some distance from the tip with the same. The bristly hairs of the upper line of the tail are about three inches in length; some of them, as well as those at the extremity, are without the subterminal annulation of hoary; this annulation, however, is always present on the sides. The rusty hairs of the under surface of the tail are ashy at the base (the rusty tinge beneath the tail passes gradually into hoary on the sides and top).

The soft fur of the back and sides is about an inch in length. This is lead colored at the base; the terminal half is a rusty yellowish, near the vertebral region, gradually becoming lighter towards the belly; sometimes very faint black tips may be distinguished.

The specimen (65) as described above is a rather young male in full winter dress. A female killed at the same time (March, 1852) is almost precisely similar.

In a considerable number of specimens before me, from different regions of North America, I am unable to perceive any external differences of specific value, and the variations are very trifling. In a young animal from Texas, there is less black than as just described. Specimens from California and Oregon seem to have the black line of the tail more distinct. A skin from Nappa valley (1194) has the tail more slender than in eastern specimens, the upper parts more hoary, and the rusty or cinnamon tints lighter. In a skin from San Francisco, a sooty tinge pervades the soft fur along the vertebral region of the back.

A gray fox, No. 1711, brought by Captain Pope from the Llano Estacado, since the above article was written, differs from most others in the collection, in being generally much lighter in color, compared with specimen 64 from Washington. The fur is much fuller and softer, the gray tips to the hairs more extensive. The chestnut gorget of the throat is entirely wanting, or only indicated by a slight wash, leaving the entire under parts of a creamy white, from the chin to

anus. There is much less chestnut on the legs, and their antero-internal faces are pure yellowish white, instead of grizzled gray and black. The tail is very long, measuring 16 inches to end of vertebrae, and 19 to end of hairs. The body measures 28 inches to root of tail.

These differences are, however, not enough to indicate a different species, at least, unless supported by additional specimens from this and other localities. The specimen collected by Dr. Newberry approaches the present in some particulars.

The skull of the gray fox (No. 968) exhibits in general the elongated form of the foxes, although the muzzle is much shorter and more slender than in those of which the *Vulpes fulvus* is the type. Thus, the distance from the incisors to the anterior portion of the orbit is but little more than one-third the total length of the head, instead of being little less than one-half. The nasal bones themselves are about one-third the total length of the skull, while in the red foxes they are two-fifths. The distance from incisors to point of orbital process of the frontal bone is but little more than half the total length of head, instead of being much more. The distinctions are, however, perhaps most strikingly seen in the character of the temporal crests and the shape of the lower jaw. These crests form a lyre-shaped figure on the top of the head, commencing with the occipital crests, which, passing a little forward and inward, come in contact with each other about a quarter of an inch anterior to the plane of the occiput, separated, and the interspace sometimes filled up, by the interparietal. On touching, these crests diverge rapidly in a gentle curve, convex outwards, and attain their greatest separation (about an inch) a little beyond the middle of the parietal; they then approximate again, coming closest at the fronto-parietal suture (about $\frac{3}{4}$ of an inch apart;) then again diverge, curving slightly outwards to the orbital process of the frontal. The ridge is very distinct on both sides, depressed and rounded; most elevated just behind the orbital process. The space between the ridges or crests of opposite sides is smooth and slightly convex; below the crests, the temple is much roughened for the attachment of the muscles. The orbital process is angular; convex before, concave behind; there is a deep longitudinal fossa along its base within, and along the temporal crest, which is continued backwards as a shallow gutter to the junction of the two crests; there is also a slight concavity across the posterior portion of the process.

In the red foxes, on the other hand, the temporal crests of opposite sides are very close together, and sometimes form a single median one for some distance after leaving the occiput, or are so closely approximated that there is but little space between them. Nearly or quite in contact at the fronto-parietal suture, they rapidly separate and run off along the posterior border of the orbital process. This ridge does not project, as in the gray foxes, above the level of the skull, nor is the supra-orbital fossa so deep.

Another striking peculiarity in the skull of the gray, as distinguished from the red foxes, is seen in the outline of the suture of the malar bone with the upper maxillary. In the red foxes the anterior base of the malar is deeply bifurcated, one branch extending a considerable distance downwards, nearly continuous with the lower edge of the bone, and another branch passes along nearly horizontally, leaving a deep and almost rectangular notch between the two. In the gray foxes, however, although there is a partial bifurcation, the downward branch is very short and broad, instead of running to a point. The horizontal branch is little above the level of the others, and sometimes the suture passes obliquely across, with scarcely any indication of an angle.

The skull of the gray fox exhibits, in the peculiar character of its temporal ridges and the

notch of the lower jaw, a close resemblance to the *Canis megalotis* or *Agriodius megalotis* of the Cape of Good Hope. The latter genus is, however, readily distinguishable by the additional molar in each jaw, above and below.

The lower jaw of the gray foxes exhibits a striking peculiarity on its lower margin. This is cut abruptly out a short distance in front of the descending ramus, and the outline continues to the end above the level of the rest of the anterior portion. In the red foxes there is only a gentle curve upwards at this point.

In consequence of the shorter muzzle of the gray foxes, the distances between the teeth are but slight, these in fact, especially in the lower jaw, being nearly in contact. There is no very striking difference in the teeth of the gray and red foxes, except that the crowns are encircled more or less by a kind of raised rim or margin, within which are the various tubercles, &c. Portions of such a border are seen in the red foxes, but seldom so complete; thus in the upper sectorial the basal ridge or rim extends on the inside all the way to the anterior internal tubercle, instead of involving only the posterior half of the tooth. The teeth, as already stated, are closer together, and while shorter antero-posteriorly, are considerably higher. In the lower sectorial there is a tubercle on the outer side of the middle cone near the base, not seen in the red foxes.

Skulls from Texas show a rather narrower muzzle, with shorter and broader nasals. There is, however, a considerable difference in this respect in specimens from Pennsylvania and Maryland, and a greater number from the first mentioned district would probably exhibit the same variation of characters.

A young gray fox skull from Pennsylvania is in the process of shedding the milk teeth. The temporal ridges are as described in the adult skull, though not very decided. The skull is considerably swollen on the middle just behind the line connecting the points of the orbital processes. The permanent incisors, first premolars, and first molars are all in place, the canines and the fourth premolar, and second molar above, are not quite up, although their predecessors have been shed. The third or posterior molar has just commenced to pierce the bone. The second and third temporary molars above, the second, third, and fourth below, are still in place. The third deciduous molar above, though smaller, is much like the fourth permanent molar, the inner tubercle more nearly opposite the centre of the tooth, and with a supplementary pointed tubercle in the middle of the antero-internal face. The second and third lower deciduous molars are like their successors; the fourth premolar is shaped almost exactly like the first true molar immediately posterior to it.

The question as to which of the two names, *virginianus* and *cinereo-argentatus*, should be retained for the species, is rather a difficult one to settle. Both Erxleben and Schreber describe the gray fox under the two names; the former author mentioning *virginianus* first; the latter, *cinereo-argentatus*. The dates of the published works of these authors are 1777 and 1778, respectively. Curiously enough, however, Erxleben, in 1777, quotes volume, page, and plate of Schreber's work of 1778, showing that the latter was probably published in parts, and that the portion relating to the gray fox had actually appeared in 1777, before Erxleben printed his *Systema*.

The description by both authors of this fox under the name of *Canis cinereo-argentatus*, is much more accurate than under *C. virginianus*. There can, however, be no question of the species, as indicated by the latter, on account of the reference to Catesby, and as his article was the first published notice of the animal, it may, perhaps, be allowed to turn the scale in favor

of the name, *virginianus*, especially as a strict construction of the law of priority, as based on the evidence of the date of publication on the title page, would lead to the same result.

It is somewhat remarkable that in a considerable number of fossil teeth and jaws of foxes from the bone cave of Carlisle, Pennsylvania, and other localities, there should be none referable at all to the red fox. All have the peculiar characteristics of the gray foxes already mentioned. It is, however, difficult to consider them altogether the same with the *Vulpes virginianus*, which, also, they exceed quite considerably in size. Comparing them with the oldest and largest of seven gray foxes before me, the muzzle is broader, the head between the orbits much more so, the zygoma higher anteriorly. The teeth are also much larger. The lower jaw is higher, and the upper outline, exclusive of the teeth, is nearly straight, not slightly concave; the height behind the sectorial teeth is six-tenths of an inch, instead of 0.45, as in the recent specimens. The teeth are larger in every way, and the posterior molar has but one pointed central tubercle, instead of two twin ones. There are other differences, which I shall not now stop to enumerate. I do not venture, however, to impose a new name, as I doubt whether I have yet seen the largest size of the gray foxes, and am consequently ignorant of the changes which the skulls may undergo.

Measurements of skulls.

	No. 968, ♀. Washington.		No. 845, young. Pennsylvania.		No. 1175. Texas.	
	Inches and 100ths.	100ths of total length.	Inches and 100ths.	100ths of total length.	Inches and 100ths.	100ths of total length.
SKULL.						
Total length	4. 68	1. 00	4. 48	1. 00	4. 59	1. 00
Intermaxillaries to condyles	4. 66	. 99	4. 32	. 96	4. 47	. 97
Greatest width	2. 60	. 55	2. 37	. 52	2. 57	. 56
Greatest height above basi-occipal	1. 43	. 35	1. 45	. 32	1. 37	. 29
Distance between orbits	. 92	. 19	. 87	. 19	. 95	. 20
Distance between points of orbital processes	1. 47	. 31	1. 25	. 28		
Nasal bones, length	1. 64	. 35	1. 36	. 30	1. 56	. 34
Nasal bones, width before	. 41	. 08	. 40	. 08	. 41	. 09
Narrowest part of muzzle behind incisors	. 72	. 15	. 76	. 17	. 70	. 15
Upper incisors, from front to hinder margin of palate	2. 33	. 50	2. 20	. 49	2. 23	. 49
Upper incisors, width between external edges	. 52	. 11			. 51	. 11
Upper molars, length taken together	1. 72	. 36	1. 70	. 38	1. 68	. 36
Upper molars, least distance between	. 48	. 10			. 45	. 09
Lower jaw, length excluding incisors	3. 41	. 73	3. 23	. 72	3. 37	. 73
Lower jaw, height	1. 50	. 32	1. 43	. 31	1. 47	. 32
Between line of orbital processes to occiput	2. 34	. 50	2. 22	. 49	2. 20	. 48
End of nasals	2. 17	. 46	2. 12	. 47	2. 10	. 45
End of intermaxillary	2. 67	. 57	2. 65	. 59	2. 60	. 56
Orbit to end of intermaxillary	1. 72	. 36	1. 73	. 38	1. 75	. 38

List of specimens.

Catalogue number.	Corresp'ng number of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n.	Collected by
64	968	♀	Washington, D. C.	Mar. 3, 1852	R. J. Pollard		Skin	
65	974	♂	do	do	do		do	
1556	2385		Rowleysburg, Va.		A. Brakeley			
1654			Spottsylvania co., Va.		A. W. Massey			
779			Tremont, Ill.		W. J. Shaw			
130	1116		Eagle Pass, Tex.		Maj. W. H. Emory			A. Schott.
201	1175		do		do			do
1386			Presidio, Cal.		Lt. W. P. Trowbridge			
1940	2616		Petaluma, Cal.		E. Samuels	380		
1194			Nappa valley, Cal.		Lt. R. S. Williamson			Dr. J. S. Newberry.
1016			Fort Vancouver, O.T.	1855	Dr. Geo. Suckley	54		
1017			do	do	do	55		
1711		♀	Llano Estacado, Tex.	Jan. 7, 1856	Capt. J. Pope	194		

VULPES (UROCYON) LITTORALIS, Baird.

Coast Fox, Short-tailed Fox.

SP. CH.—Scarcely more than half the size of the common gray fox (*Vulpes virginianus*). Tail one-third the length of body. Above, hoary and black; sides of neck, fore legs, and lower part of sides, dull cinnamon; chin and sides of muzzle, black. Tail with a concealed mane of stiff hairs, and with a black stripe above.

This very curious fox, the smallest of all the North American species, was brought by Lieut. Trowbridge from the island of San Miguel, on the coast of California, where quite a number of specimens were seen. It is stated by Lieut. Trowbridge to be very tame, scarcely taking the trouble to get out of the way, and when escaped from a trap, returning directly to the same place. His men found no difficulty in outrunning these foxes in a fair race, although it is possible, that owing to their unusual tameness, their full powers were not exerted.

The species is a miniature of the common gray fox of the United States, and so closely like it in external appearance as to induce the belief of its being possibly a local race. Gray foxes from the main land of California are, however, of full size, and there are some differences of importance in the skull and teeth. As is well known, also, many species of foxes of different regions resemble each other so closely that it is very difficult to separate them—more closely, indeed, than the present fox and the common gray species.

The *Vulpes littoralis* is scarcely more than half the size of the common gray fox, in length and height, in fact, exceeded by some common house cats. The body, however, is considerably stouter than in the house cat. The limbs are short, slender, and weak. The tail in the specimen before me is very short, not more than one-third the length of the head and body. It has probably lost some of the terminal vertebræ at an early age, although the tip is now covered with hair. Two living specimens in captivity are said by Lieut. Trowbridge to possess this same brevity of tail.

As already stated, the colors are similar to those of the common gray fox. The upper parts

and sides are of a mixed grayish white or hoary, and black. The under parts are of a dull brownish white, with lighter tips. The convexity of the ears is grizzled like the back; the base of the ears, sides of the neck, a considerable portion of the limbs, and lower part of the sides are light rusty or cinnamon. The sides of the muzzle, midway between the eye and the nose, with nearly the entire chin, together with the margins of the lips, are black; the lower half of face and part of the throat, pure white. The tail is hoary on the sides, rusty beneath, with a well defined narrow stripe of black above. It has the same concealed mane of stiff bristly hairs as the gray fox.

This animal differs very slightly in appearance from the average of gray foxes. The convexity of the ear is nearly of the same hoary-gray as the back, instead of being rusty. The fur is softer and fuller, the coarse hairs not much exceeding the under fur. The tail is much shorter, but this character cannot be relied on as permanent. The chief external distinction is that of size, the head and body measuring in a perfectly adult animal but 18 inches, instead of 24 to 28. The tail is only about $6\frac{1}{2}$ inches.

Measurements from a specimen in alcohol.

	Inches.	Lines.
Nose to occiput	4	4
Nose to eye	1	6
Nose to ear	4	3
Nose to root of tail	17	-----
Nose to end of outstretched hind leg	18	4
Tail from root to end of vertebræ	6	-----
Tail from root to end of hairs	8	-----
Ears, height posteriorly	2	1
Ears, height anteriorly	2	2
Ears, height internally above skull	2	-----
Ears, width	1	4
Arm, between claws cross shoulder	1	3
length of fore arm	2	3
from elbow to end of claws	5	4
fore foot to end of claws	2	5
longest claw	-----	5
Leg, from knee joint to end of claws	7	-----
tibia	4	-----
hind foot from heel to end of claws	3	6
longest claw	-----	4

Skull.—The skull of this diminutive fox, the smallest of those belonging to the American continent, bears a very close relationship to the gray fox, although it differs in some appreciable features. It is very considerably smaller, a fully mature skull measuring barely four inches by 2.08, while a corresponding one of the other species measures 4.80 by 2.60.

The nasal bones are short, about three-tenths the length of the skull. They are broader than in *V. virginianus*, narrowest near the middle, posterior to which they expand, and finally round

off rapidly to a point. The intermaxillary is applied along their anterior half, the frontal along the posterior third of the outer edge. The temporal ridges are sufficiently distinct. The anterior portion of the frontal bone is considerably swollen above the eyes, these elevations separated by a deep depression along the median line and ceasing a little posterior to the centre of the orbit. The lateral profile shows a depression in the upper outline of the skull at this point.

An appreciable peculiarity of this species is seen in the anterior base of the zygoma. The suture of this shows no bifurcation of the malar at all, but merely a broad emargination, with irregular or zig-zag outline. The bone is produced forwards, inwards, and upwards as a narrow process, which occupies not one-third the space between the edge of the orbit and the ante-orbital foramen. In the gray fox the space thus occupied is nearly or quite half this distance, sometimes a little more.

Measurements of skulls.

	$\frac{2154}{1351}$, San Miguel.		$\frac{2275}{1417}$, San Miguel.	
	Inches and 100ths.		Inches and 100ths.	
Total length	3. 86	1. 00	3. 93	1. 00
Greatest width.....	2. 07	. 53	2. 20	. 56
Greatest height	1. 19	. 31	1. 26	. 35
Distance between orbits	. 76	. 20	. 86	. 21
Distance between points of orbital processes	1. 18	. 30	1. 26	. 32
Nasal bones, length	1. 18	. 30	1. 20	. 30
Nasal bones, width before	. 34	. 09	. 36	. 09
Narrowest part of muzzle between incisors	. 61	. 15	. 65	. 16
Upper incisors, from front to hinder margin of palate	1. 91	. 49	2. 00	. 50
Upper molars, length taken together.....	1. 43	. 37	. 80	. 20
Upper molars, distance between	. 42	. 10	. 50	. 12
Lower jaw, length	3. 40	. 88	2. 93	. 74
Lower jaw, height	1. 42	. 37	1. 26	. 32
Between points of orbital processes to occiput	2. 00	. 51	2. 05	. 52
Between points of orbital processes to end of nasals	1. 77	. 45	1. 70	. 43
Between points of orbital processes to intermaxillaries.....	2. 10	. 54	2. 12	. 53
Orbit to end of intermaxillary	1. 38	. 35	1. 44	. 36

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
1351	2154	Island of San Miguel, off the coast of California, 30 miles from Santa Barbara.	Lt. W. P. Trowbridge, U. S. A	Skin.
1417	2274		do.....	Alcohol

FAMILY.
VIVERRIDÆ.

Tubercular molars, two above and one below; sectorial tooth typical; feet digitigrade or plantigrade; claws retractile; a short coecum.

The species of this family are usually animals of moderate size, averaging, perhaps, that of the domestic cat, with a more slender and elongated body and more pointed muzzle, the tail long and generally annulated. There is in some respects a resemblance in form to the martens. The legs are short and the feet are usually five-toed, though in the mangoustes (*Cynictis*) the hind feet have but four toes, while in *Ryzaena* all the feet exhibit this number. In the greater or less degree of retractility of the claws, the family is distinguishable from the martens and exhibit an approach to the cats. Most species are digitigrade, with hairy soles; a few have them naked. They have the two anal glands of the *Mustelidae*, with others in the anal and pubic regions peculiar to them.

The typical dental formula of the *Viverridae* is—incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{2-2}{2-2} = \frac{20}{20} = 40$. In a few genera the first permanent premolars are not developed. The dentition differs from that of the *Canidae*, which it otherwise resembles, in having one tubercular true molar less in each side of the lower jaw. There are two of these tubercular molars on each side, above and below, posterior to the sectorial teeth. The *Mustelidae*, on the other hand, have only one such tubercular molar.

The geographical distribution of the *Viverridae* is quite restricted. Only one genus, *Bassaris*, is found in the New World; all the others are inhabitants of Africa and Southern Asia. A single species, the genet, (*Viverra genetta*,) occurs in Southern Europe. The African *Viverra civetta*, or civet cat, furnishes a well known musky substance called civet, a secretion from the peculiar anal glands. This is obtained sometimes from trees, upon which it is ejected by the animal, sometimes directly from their glandular pouch.

BASSARIS, Licht.

Bassar, (Licht.) WAGLER, Isis, 1831, 512.

Licht. Darstellung Säugt. 1827-34.

Head short, acuminate; ears large; feet digitigrade, five-toed; soles hairy, with naked pads; tail as long as the body, annulated.

This genus, confined to Mexico, and the more southern parts of the United States, is the sole representative in the new world of the genets, civets, ichneumons, mangoustes, suricates, &c., of the old. The body is slender and elongated, the muzzle pointed, the ears projecting, the tail long, and ringed with black and white. The claws are half retractile, five on each foot.

The skull is intermediate in form between that of the martens and the civet cats, and like them exhibits only an indication of the post-orbital process of the frontal bone.

The dental formula is as in the typical *Viverridae*, but differ from that of *Viverra*, in having the inner process of the upper sectorial tooth much more developed, and reaching to the middle of the tooth; the anterior lobe of the lower sectorial shorter than the two middle.

It is as yet uncertain whether America possesses one or two species of *Bassar*, further investigation being necessary to determine the character of the California species. They are found as far north as Red River, Arkansas, on the eastern slope of the continent; on the western to the latitude of San Francisco; southward they extend throughout temperate Mexico. They bear in the United States the name of civet, Mexican, or ring-tailed cats, and are frequently tamed in Mexico and California; in the latter country they are great pets of the miners.

Very little is known of the internal anatomy of the genus, or as to the precise measure of their relationships to the other *Viverridae*. They have at least four young at a birth, this being the number of a litter found by Mr. Clark on the San Pedro, Texas.

BASSARIS ASTUTA, Licht.

Civet Cat.

Bassar astuta, ("LICHENSTEIN,") WAGLER, Neue Thiere Mexicos, in Isis, XXIV, 1831, 512, 513.

LICHENSTEIN, Darst. Säugt. 1827-34; tab. xliii.

WAGNER, in plates of Schreber, Säugt. III; pl. cxxv, C.—Jb. Suppl. Schreb. II, 1841, 278.

CHARLESWORTH, Pr. Zool. Soc. Lond. IX, 1841, 60. (Habits.)

EYDOUX & SOULEYET, Voy. de la Bonite, Zool. I, 1841, 18; pl. iv. (Skull.)

AUD. & BACH. N. A. Quad. II, 1851, 314; pl. xcvi.

Cacamiztli and *Tepe maxlaton*, HERN. Thes.

Licht. Abh. Berl. Akad. 1827, 89.

SP. CH.—Size about that of the domestic cat, but rather more slender. Above, brownish yellow, mixed with gray; beneath, white; tail white, with six or eight black rings.

No specimens of this species were collected by any of the expeditions, although several were brought in by the United States and Mexican Boundary Survey, in the reports of which a full description will be found.

Only one authenticated skin, (No. 2343,) has been received from California; this is a hunter's skin, not sufficiently perfect to furnish a full description.

FAMILY.

MUSTELIDAE.

FAM. CH.—Carnivora, with a single tubercular molar tooth only, on either side of each jaw ; the sectorial premolar of typical shape. Feet five-toed ; plantigrade or digitigrade. Coecum wanting.

The preceding diagnosis, taken from Wagner, expresses in few words the characters of a group of the Carnivora with numerous representatives in America. Most species are of small size, the weasels especially—the smallest of true carnivora—while others, as the badgers, gluttons, &c., attain very respectable dimensions. The feet vary in character, sometimes naked, at others hairy, with or without naked pads. The nature of the soles, according to Wagner, is however, no indication as to whether the animal is digitigrade or plantigrade ; those of the former character having them sometimes naked, and of the latter, hairy.

The food of the *Mustelidae* varies much in its nature, the species of different groups being sometimes purely carnivorous, at others omnivorous. In the absence of a coecum, they approach the bears. Most species have anal glands, which secrete a foetid liquid, which, in the American skunks, reaches the maximum of offensiveness.

The *Mustelidae* are usually divided into four sections, although Burmeister refers them all to three, having the following characters :

1. *Martinae*.—With a small, short, and decidedly transversely elongated posterior molar in the upper jaw, and an unequal number of molars, generally, in the two jaws. (Martens, weasels.)

2. *Lutrinae*.—With a large quadrate posterior upper molar ; the number of molars in the two jaws equal. (Otters.)

3. *Melinae*.—With a large quadrate posterior upper molar ; the number of molars in the two jaws unequal, as in the *Martinae*. (Badgers and skunks.)

Wagner constructs a fourth group of *Mellivorae*, to include *Ratellus* and *Galictis*. Burmeister, however, places both among the *Martinae*, although the former genus is aberrant in having the number of molars the same in both jaws, through the deficiency of one lower true molar, leaving but a single true molar above and below. “ With the exception of *Ratellus*, then, all the *Mustelidae* have one true molar on each side above, and two below. The upper true molar is supported by one inner and sometimes by one, (*Putorius*, *Gulo*,) sometimes two, (*Mustela*, *Lutra*, *Mephitis*,) outer fangs. The second true molar below, is also tubercular, but has a single fang.” (Owen.)

SUB-FAMILY MARTINAE.

Upper true molar short, transversely elongated ; molars unequal in number in the two jaws. Soles generally hairy ; the walk more or less plantigrade.

In this sub-family are included many animals peculiar to North America, and for the most part inhabiting the higher latitudes ; a few species, however, occur in the warmer regions of the continent. The genera with which we have here to do are *Mustela*, *Putorius*, and *Gulo*, the second one susceptible of several subdivisions.

MUSTELA, Linn.

Mustela, LINN. "Systema Naturae, I, 1735."

Teeth 38. Molars one above, two below; premolars, four above and below, on each side. Lower sectorial tooth with a small internal tubercle. Body slender; tail rather long.

This genus embraces the martens in distinction from the weasels; species usually of large size, arboreal habits, and (some of them at least) yielding furs of great value. They are scattered over many regions of the globe, only two of them belonging to the continent of North America. One of these, *M. pennantii*, is the largest of the known species; the other, *M. americana*, is a near representative of the pine marten of Europe, and in some of its varieties of the sable, *M. zibellina*, of the old world.

The dental formula of this genus is—incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars $\frac{1-1}{2-2}$ $\frac{18}{20}$
= 38.

MUSTELA PENNANTII, Erxl.

Fisher; Black Cat.

Mustela pennantii, ERXLEBEN, Syst. An. 1777, 479. (Based on Fisher of Pennant.)

J. SABINE in Franklin's Narr. 1st Journey, 1823, 651.

GRIFFITH's Cuv. V, 1827, 125.

FISCHER, Syn. Mamm. 1829, 217.

GODMAN, Am. N. H. I, 1831, 203.

Mustela canadensis, SCHREBER, Säugt. III, 1778, 492; tab. cxxxiv. (*Pekan* of Buffon.)

BODDAERT, El. Anim. I, 1784, 86.

GMELIN, Syst. Nat. I, 1788, 95.

KUHL, Beiträge, 1820, 74.

DESMAREST, Mamm. I, 1820, 183. (*Pekan*.)

HARLAN, Fauna Americana, 1825, 65.

RICHARDSON, F. B. A. I, 1829, 52.—*IB.* Zool. Beechey Voyage, 1839.

MARTIN, Pr. Zool. Soc. Lond. I, 1833, 97. (Anatomy.)

WAGNER, Suppl. Schreb. II, 1841, 223.

DEKAY, N. Y. Zool. I, 1842, 31; pl. xiii, f. 1. (Skull.)

AUD. & BACH, N. A. Quad. I, 1849, 307; pl. xli.

GIEBEL, Säugt. 1855, 773.

Mustela melanorhyncha, BODDAERT, Elen. Anim. I, 1784, 88. (*Fisher of Pennant*.)

ZIMMERMANN, in Penn. Arkt. Zool. I, 1787, 85.

Viverra piscator, SHAW, Gen. Zool. Mamm. I, 1800, 414. (*Fisher of Pennant*.)

Viverra canadensis, SHAW, Gen. Zool. Mamm. I, 1800, 429. (*Pekan* of Pennant.)

Mustela nigra, TURTON's Linnæus, I, 1806, 60.

Mustela godmani, FISCHER, Syn. Mamm. 1829, 217.

Le Pekan, BUFFON, Hist. Nat. XIII, 1765, 306; tab. xlii.

Pekan weasel, PENNANT, Hist. Quad. 1781, No. 202.—*IB.* Arctic Zoology, I, 1784, 78. (Appears to be an original description from the specimen of Brisson and Buffon.)

The Fisher, PENNANT, Syn. Quad. 1771, 223.—*IB.* Hist. Quad. 1781, 328.—*IB.* Arctic Zoology I, 1784, 82.

SP. CH.—Legs, belly, tail, and hinder part of back, black; the back with an increasing proportion of grayish white to the head. Length, over two feet. Vertebrae of tail exceeding twelve inches.

The general appearance of this animal is more fox-like than musteline, in its long head,

bushy tail and large size. Some specimens, indeed, are fully equal in size to a fox two-thirds grown, though others are not more than half as long.

The muzzle is quite large; the septum between the nostrils naked, and reaching nearly to the edge of the lip. The ears are rather low, but very wide, the length of base being twice the height. The eyes appear to be rather large for the genus.

The feet are short but stout, and well armed with sharp strong claws. There is a naked ball under the end of each of the five toes, and another V-shaped one on the palm and soles, the angle anterior and truncated; the palmar callosity further from the phalangeal ones than the plantar is. There are no other callosities on the hind foot; on the fore foot, however, there are two small ones, higher up, opposite each other; the palmar one about intermediate between them and the phalangeal.

The tail is long, rather shorter than the body, without head and neck; thick and bushy at the base, and tapering rapidly and uniformly to an acute tip. In a winter specimen, (1009,) the naked bulbs of the feet are much more overgrown with hair, so as nearly to conceal them; they are, however, evident on close examination.

The hair is composed of two sorts—one long and coarse and a basal softer fur. It is longest and fullest on the lower portion of the back.

Specimens vary considerably in color. In the largest specimen before me, (1005,) it is glossy black, including the tail, the rump, the legs, and the whole under parts. Towards the middle of the back there is a mixture, first of brownish, then of yellowish gray, very conspicuous about the shoulders and nape, still lighter on the top and sides of the head. This variation is caused chiefly by the long coarse hairs, which on the tail are entirely lustrous black, except a reddish gray tinge at the base. Progressing anteriorly, however, this lighter base extends further along the hair, and becomes purer and lighter in color, until on the shoulders the hairs are black at point, dusky at tip; the intermediate third brownish white. The under fur, however, is of a brownish plumbeous, lighter at the base, varying somewhat in tint with the long hairs. Under the base of the lower jaw, and between the legs, fore and hind, are patches of white hairs, as also in the axillæ, largest about the genital region.

The preceding description represents, perhaps, the extreme condition of dark coloration, other specimens are much lighter, the hairs on the tail showing much dark chestnut towards the base, and this changing to a clear grayish white to the head. The central line of the belly only is black. The general pattern of coloration is, however, much the same, and in all, the three white patches on the chin, chest, and abdomen, as well as those on the axillæ, are more or less visible.

Specimens of this species from the same locality vary much in size, although the materials before me are not sufficient to determine whether the impression prevalent in northern New York as to the existence of two species known, respectively, as Fisher and Black cat, is correct or not.

Numerous remains of this species are found in the great bone cave near Carlisle, Pennsylvania, among them a very fine skull of larger size than any recent one I have seen. The animal is found occasionally in the mountains north of Carlisle, in Perry county, whence I obtained, many years ago, the living specimen figured by Audubon and Bachman. It also occurs in the Allegheny region of Virginia, and even as far south as North Carolina, according to the above authors.

The scientific history of this species, as of most American animals described by the earlier authors, is very much confused; all their descriptions, however, are based essentially upon *Le*

Pekan of Buffon and Brisson, and *The Fisher* of Pennant. The description of Buffon was published in 1765 and that of Pennant in 1771. Pennant gave an excellent description of the Fisher in the *Synopsis Quadrupedum*, and also described the *Pekan* of Buffon, having visited Paris and examined for himself the original specimen described, both by Buffon and Brisson, as in the cabinet of Mr. Aubry,¹ without recognizing it as his Fisher weasel.

The next question is as to the priority of date between the two names, *canadensis* and *pennanti*, applied to the species of Buffon and Pennant. In comparing the works of Erxleben and Schreber, we find that the *Systema Regni Animalis* of the former bears date of 1777, while the text of vol. III of the *Säugethiere* of the latter is dated 1778. It may be that Schreber's work was published in parts, and that the one embracing the Fisher appeared prior to 1777, but there is no proof of the fact, and resting on the evidence of the title pages, we must give precedence to Erxleben. It is true that Erxleben quotes the plates of Schreber in various places, but these may have been accessible to him before actual publication, and at any rate, the page of text is not mentioned, as would have been done, if extant. The publication of the entire work of Schreber extended from 1775 until long after the commencement of the present century.

Confining our examination, then, to the names of Erxleben, we find on page 455 a description of a *Mustela canadensis*,² the synonymy of which includes both the *Vison* and *Pekan* of Brisson and Buffon, or the mink and the fisher. The article, however, refers exclusively to the mink, nor can it be construed in any other way. Erxleben quotes, indeed the plate 134 of Schreber, which is copied from the figure of the *Pekan* given by Buffon, but he may well be pardoned for not appreciating the difference between Buffon's figures of the *Pekan* and *Vison*. At any rate, the description of *Mustela canadensis* applies only to the mink, and actually will take precedence of the name *vison* if Brisson's authority be set aside.

On page 470, however, Erxleben describes a *Mustela pennantii*, based on the *Fisher weasel* of Pennant, about which there can be no mistake as to its applying to the subject of the present article.

¹ NOTE.—The following is a translation of Buffon's article:

Le Pekan.—Similar in teeth, character, and color of hair and shape, to the (*M. foina* and *martes*), but the feet appear proportionally a little larger, and the legs longer, especially the anterior ones, as far as I can judge from a dried and stuffed skin. It seemed to me, also, that the body of the Pekan was at least as long as in the above named species, for the stuffed skin measured a foot and a half from snout to root of tail; the body of the tail measured ten inches, the hairs extending an inch beyond.

The hair was compact and lustrous, with a very soft and full fur; the fur was ash colored from the base to near the tip, which was gray, with some yellowish tints; the hair was colored like the under fur, except where it projected beyond; this portion was gray and black, with some maroon tints; the points of the longest hairs were black. By this mixture the animal was variegated with gray and yellow on the head, the neck, the shoulders, the upper part of the legs anteriorly, and the back. On the sides of the body the gray predominated over the yellow, and the tips of the hairs produces an appearance of transverse black bands on the neck. In certain light the black was more apparent than the gray on the rump. The lower part of the fore legs, the whole of the hinder ones, the four feet, and the tail were black, mixed with brown; the breast and belly were mixed with yellow and brown. There was some white between the fore legs on the chest, and between the hind legs on the belly.

² *Mustela canadensis*.—M. corpore fulvo-nigricante, pectore macula alba.

Paullo minor Marte cui similis, longitudine 17 poll. caudae 7 poll. Auriculæ subacutae. Totum corpus pilis splendentibus saturate castaneis basi cinereis. Macula alba inter crura antea. Digiti tecti pilis densis supra et infra, cauda colore profundior ac corpus.

List of specimens.

Catalog' e number.	Locality.	When collected.	Whence obtained.	Original number.	Nature of spe- cimen.	Head and body.	Tail, verteb.	To end of hairs.
1015	Fort Dalles, O. T. -----	1855.	Dr. George Suckley.	-----	Hunter's skin.	24	14	17½
1009	-----do-----	-----do-----	-----do-----	53	-----do-----	24	12	16
1008	-----do-----	-----do-----	-----do-----	-----	Hunter's skin, head wanting.	-----	-----	-----
1477	Steilacoom, W. T. -----	-----do-----	-----do-----	45	-----	30	18	21
2000	-----do-----	-----do-----	-----do-----	-----	-----	-----	-----	-----
2246	Saranac Lake, N. Y. -----	-----	M. Baker	-----	Skull	-----	-----	-----
3080	Essex county, N. Y. -----	-----	Dr. S. E. Hale	-----	-----do-----	-----	-----	-----
1073	Madrid, N. Y. -----	-----	E. A. Dayton	-----	-----do-----	-----	-----	-----
1848	Bone Cave, Carlisle, Pa. -----	-----	S. F. Baird	-----	Skull, fossil	-----	-----	-----

MUSTELA AMERICANA, Turton.

American Sable; Pine Marten.

Mustela americanus, TURTONS Linnæus, I, 1806, 60.

Mustela vulpina, RAFINESQUE, Am. J. Sc. I, 1819, 82. (From Upper Mo. Specimen in N. Y. Lyceum.)
FISCHER, Synopsis, 1829, 215.

Mustela leucopus, KÜHL. Beiträge, 1820, 74.

FISCHER, Syn. 1829, 216.

Mustela martes, JOS. SABINE, Zool. App. to Narr. Franklin's Journey, 1823, 651.

HARLAN, Fauna Americana, 1825, 67.

RICH, F. Bor. Am. I, 1829, 51.

GAPPER, Zool. Jour. V, 1830, 203.

GODMAN, Am. N. H. I, 1831, 200.

DEKAY, N. Y. Zool. I, 1842, 32; pl. xi. f. 2; pl. xix. f. 2, (skull.)

AUD. & BACH. N. A. Quad. III, 1853, 176; pl. cxxxviii, (L. Huron.)

Mustela huro, F. CUV. Dict. des Sc. Nat. XXIX, 1823, 256.—*Id.* Suppl. Buff. Mam. I, 1831, 221.

FISCHER, Syn. 1829, 217.

Mustela zibellina, PALLAS, Spicil. Zool. XIV, 57-68.—*Id.* Zool. Rosso-As. I, 1831, 84.

GODMAN, Am. N. H. I, 1831, 208.

Mustela zibellina, var. *americana*, Brandt Beiträge, Säugethiere Russland, 1855, 16; tab. iii, f. 10.

Pine Marten, PENNANT, Hist. Quad. 1781, No. 200.—*Id.* Arctic Zool. I, 1784, 76. (From sp. in Leverian Mus.)

SP. CH.—Legs and tail blackish. General color reddish yellow, clouded with black; above becoming lighter towards the head, which is sometimes white. A broad yellowish patch on the throat, widening below so as to touch the legs. Central line of belly sometimes yellowish. Tail vertebræ, about $\frac{1}{2}$ the head and body. Outstretched hind feet reach about to the middle of the tail with the hairs. Feet densely furred.

Body stouter than in the ermine weasels, though less bulky than in *M. pennantii*. Head somewhat depressed, acute, and broader than might be looked for with so lengthened a skull. The ears are large and thickened; both sides densely coated with short velvety hairs, overlaid by stiff longer ones, which do not extend to the margins of the ears. The vertebræ of the tail are about half as long as the body, exclusive of the head; the entire tail nearly two-thirds the length of head and body. The outstretched hind feet reach but little more than half way to the tip of the tail. The legs are rather short and robust; the feet densely coated with fur; the

under surfaces of the digits completely concealed by coarse wooly hair enclosed within stiff bristles springing from the edges of the toes. A careful examination shows that the balls of the toes are naked, though these are densely overlaid by the wool just described. The claws are, however, distinctly visible, though inserted among stiff hairs as long as themselves.

The fur of this species is very full and soft, with many long coarse hairs interspersed. The tail is densely covered with hair of two kinds, like those of the back, but rather coarser; those at the tip occupy about one-third of the total length of the tail with the hairs.

It is difficult to give an accurate idea of the colors of this species owing to the variation in different parts of the body of the same specimen, as well as the difference in different specimens. On the upper parts and sides, generally, the hairs are of rather a light ash gray or grayish plumbeous for the basal three-fourths, on the rump and posterior third of body all round, including the whole belly, tipped with rusty red (sometimes saffron); above, proceeding towards the head, this reddish tint is gradually merged into a brownish ash, becoming still lighter and lighter until the tints about the head are very pale, sometimes almost white. The prevailing tint of legs and tail is a lustrous brownish black, although a close examination reveals a reddish or ashy tinge of the basal fur. The margins and external surface of the ears are nearly white, as also a patch on the throat commencing opposite the anterior base of the ear, and extending backwards to the fore legs, though not between them; the axillae are similarly blotched. In another specimen the patch on the throat is yellowish, and the axillae unspotted. In this specimen the reddish on the hinder portion of the body is more distinct.

The colors as mentioned, except on the head, are much overlaid and modified by the longer hairs interspersed, which at their tips are of a rich lustrous purplish brown or black.

The specimens just described were caught in the Adirondac mountains, New York, in February, 1855, and are in winter pelage. A summer specimen, obtained near Fort Boisé, in Oregon, in the summer of 1854, by Dr. Suckley, is not essentially different. The head, however, is much less white; the upper portion being much like the back; the sides paler. The white of the ears is quite inconspicuous. The tail and feet are brown rather than black. The patch of reddish yellow on the throat is as described, and extends quite broad to the legs, when it suddenly narrows, and continues as an indistinct stripe along the middle of the belly, and runs into a brighter patch of reddish between the hind legs.

Since this article was prepared, several additional specimens have been received from the western country, which agree very closely with the one from Fort Boisé. All are in summer fur, which is much shorter and coarser than the winter. The balls of the feet are distinctly visible in all. The colors are quite uniform, and none exhibit more than a tendency to the white of the head, as described in the New York animal. The yellow of the throat is more mixed with red.

It is barely possible that two species of pine marten may exist on this continent, as supposed by some authors. Until we have good winter specimens from the far west for comparison, with corresponding ones from the eastern portion of the United States, it will be impossible to settle the question definitely. Authors make no mention of visibly naked balls to the feet of either the European or American pine martens, even in summer; and, in fact, this is given as a point of specific difference between them and the beech marten, *M. foina*. Still, I find them in a summer specimen of *M. martes*, (378,) from the Swedish Academy.

The sexes differ in the larger size of the males, and (in the two Adirondac specimens) in the lighter reddish on the body of the female. The patch on the throat is much lighter in the male.

The skull, too, of the female appears a little different in the specimens compared; the cranium of the male being more contracted in proportion, and the head generally narrower than in the female. This may, however, be merely the effect of age.

Measurements.

	<i>M. martes</i> , Sweden.								
	549.			550.			379.		
	Inches.	Lines.	100ths of length.	Inches.	Lines.	100ths of length.	Inches.	Lines.	100ths of length.
Nose to root of tail.....	17			14			23		
Nose to end of outstretched hind legs.....	22			19					
Tail, from root to end of vertebræ.....	6	9		5	4		9	6	
Tail, from root to end of hairs.....	10	3		8	5		13	6	
Skull, length.....	3. 12		100	2. 74		100	3. 60		100
Skull, width.....	1. 57		50	1. 40		51	1. 95		54

A good deal has been written upon the relationships or differences of the martens of Europe and America. A series of several specimens from Sweden, collected at the same season of the year with the Adirondac specimens, furnish the following comparisons.

The Swedish specimens are much larger, although the skulls appear to indicate the same age. The fur is harsher and coarser, and the prevailing tints paler; the tail and feet are not very dark brown, instead of being almost black. The color of the fur at the base is lighter. The throat patch does not touch the fore legs.

The tails of the European specimens appear longer in proportion to the body, and there is a decided difference in the extent of the naked balls on the ends of the toes, which in the European are distinctly visible or but partially concealed, while in the American it is only after the most careful examination that anything of the kind can be detected. Differences in the skull are still more tangible, and seem quite characteristic. These are shown in an annexed table.

The sable, *M. zibellina* has as yet not been definitely ascertained to belong to this continent, though the American marten is called sable in New York and the fur countries, bearing this name also in the trade. The true sable is readily distinguishable by the short tail, which does not extend as far as the end of the outstretched hind feet, and by the balls of the toes covered entirely with woolly fur. Its colors, however, though darker, are not very dissimilar to the American marten.

In some respects, as in certain features of the skull and teeth, the American marten approximates to the beech marten, *M. foina*, more than to the European true marten. The beech marten can, however, be known by the naked pads on the soles as well as the toes; the whiter spot on the throat, (not so yellowish,) &c.

Comparison of skulls of—

<i>Mustela Martes.</i> European. (Sweden.)	<i>Mustela Americana.</i> American. (Essex county, N. Y.)
Width of muzzle behind canines—	
• Half the width of cranium	Not half the width of cranium.....
Sides of muzzle—	
Nearly parallel.....	Tapering
Greatest contraction of frontal bone—	
Nearly in the middle of the skull.....	Considerably more anterior
Orbital processes of frontal—	
Nearly midway between the greatest contraction of frontal bone and the suture of the malar bone with the frontal in the edge of the orbit.	Much nearer the former
Temporal ridges—	
Soon approximating and running close together, nearly parallel.	Not approaching rapidly.....
Greatest breadth of head—	
Decidedly more than half the length.....	About half the length
Posterior upper molar, measured across the constricted portion—	
More than half the greatest diameter of crown ..	Just half the greatest diameter of crown, or less
Inner spur of penultimate upper molar—	
Much larger than in the American.....	.....
Section of crown of penultimate upper molar—	
Sub-triangular, the transverse diameter about two-thirds the longitudinal.	Sides parallel; the transverse diameter one-half the longitudinal.
.....	Head more slender, elongated; muzzle tapering

Since the preceding article was written, I have received an elaborate paper by Dr. Brandt, the eminent Russian zoologist,¹ in which he enters into a detailed comparison of the *Mustela americana* with the Asiatic sable, *Mustela zibellina*, and comes to the conclusion that they both belong to the same species, being merely continental varieties. He describes and figures many permanent varieties of the Asiatic European sable, and finds that the American is an intermediate connecting link between some of the others. With several American skins from the northwest coast, as far south as the Columbia river, before him, a careful comparison with the rich series in the St. Petersburg museum, brings him (page 17) to the following conclusions:

In all the American sables he had seen, the head is uncommonly light colored, with the exception of the upper part of the muzzle, which is more or less of a light grayish brown color, sprinkled or mixed with white; the head is brownish white.

The tail is of much the same length with the Asiatic sable, but less bushy, and browner; not so black at the end. The long hairs are more blackish brown than brownish black. The fur of the body is less dense.

He concludes with saying: "As I can find no difference between the Asiatic and American

¹ Beiträge zur nähern Kenntniss der Säugethiere Russlands, von J. F. Brandt. 4to: St. Petersburg, 1855. Erste Abtheilung Selbstständige Mittheilungen über den äussern Bau des Zobels (*Mustela zibellina* var. *asiatica* und *americana*), im Vergleich mit dem des Baum- und Steinmarders (*Mustela martes* and *foina*).

sables in the character of the head, ear, tail, and feet, and as, even in respect to color, the sables of the Nischnaja Tunguska, sent home by Middendorff, occupy an intermediate position between the dark Asiatic and yellow American sables, I am induced to consider the American animal rather as a yellower or more yellowish brown, and less densely furred variety of the Asiatic sable than as a distinct species, or as a pine marten (*Mustela martes*).''

The author then presents the diagnosis of the three species of allied *Mustela*, (*M. zibellina*, *martes*, and *foina*,) as follows :

Mustela zibellina, (*asiatica et americana*).—Tail without the hairs, about one-third the body ; shorter than the outstretched hind feet. The muzzle longer and more pointed. The top of the snout and the chin differing very slightly, if at all, from the side of the head in any darker coloring, especially the chin ; much lighter than the upper or middle portion of the fore paws. The sides of the neck and the head very different from the trunk in the lighter color, and especially in the greater or less sprinkling or etching of white. The sides of the head, from the eye to the ear, whitish, more or less mixed with brown. The upper border of the ear obtusely triangular. The whiskers scarcely reach as far back as the ear. The posterior surface of the ear lighter, rarely (especially in the American specimens) darker than the light nape. The throat and lower neck either only white here and there, or washed with light brownish yellow, or with smaller or larger whitish, yellowish, or orange brown spots, of varying size and number, of rounded, elongated, or angular form. When there is a well developed gular blotch it ends anteriorly in a single point. The color of the paws and lower part of the thighs quite uniform brownish black, or rather blackish brown, especially on the paws. The basal and median stiffer straight outer hairs of the black or blackish brown tail, even in winter, are shorter than the terminal ones ; the tail is consequently only tolerably bushy, most so at the end ; it is uniformly black from base to tip, sometimes more or less sprinkled with white. The whole body is covered with long stiff lustrous blackish brown or black hairs, sometimes, or almost always, mixed with white or white tipped ones. The very stiff bristly hairs of the toes enveloping the claws, and more or less hiding them. The pads at the ends of the toes mostly covered with hairs in the winter, leaving a very small portion not overgrown ; in summer mostly bare.

Measurements in inches.

Locality.	Tip of nose to—			Tail, from anus to end of—		Length of—		Nature of specimen.
	Eye.	Occip.	Tail.	Vert.	Hairs.	Fore ft.	Hind ft.	
Russia	1½	3 ⁵ / ₁₇	16½	4½	7½	1½	3½	Freshly killed.....

Mustela martes.—The tail without the hairs about one-half or more than one-half the length of head and body, extending almost one-third its length beyond the outstretched hind legs. Muzzle shorter. Ridges of the fleshy palate much as in the sable. The upper part of the muzzle and the chin blackish brown, less light than the upper part of the dark blackish brown paws, and consequently separated from the light upper surface of the head (the vertex

especially) by darker coloring. A spot behind the ear and a smaller one above and behind the eye are similarly colored. The color of the head differs from that of the trunk only in the greater or less amount of sprinkling of white. The upper margin of the ear is rounded, without a projecting blunt point. The appressed whiskers reach behind farther than the ear. The blotch on the lower part of the neck ends anteriorly under the throat in five to six small points (three, more rarely four, median, and two lateral); posteriorly, it terminates always in one simple point, continued but ending between the fore legs; this spot is usually light yellow, or varying to light brownish orange yellow, not rarely interrupted by single brown spots. The under fur in the gular blotch is whitish, or yellowish orange, or almost white. The paws and inside of the feet are distinguished from the outer side of the lower thigh (which is colored more or less like the trunk) by a blackish brown darker color. All the stiff straight contour hairs of the tail (with the yellowish gray under fur) in winter are much lengthened, and form a bushy brush from the base; the tail is grayish brown nearly to the middle, then blackish brown, with single whitish contour hairs. The entire trunk, including the lower thigh, is covered with moderately stiff light grayish brown softer hairs, a little darkest on the lower thigh. The under fur of the trunk, with the exception of the throat, in winter is light ash gray at the base and in the middle; at the end light brownish gray. The moderately stiff bristly hairs of the toes do not conceal the claws, being constantly shorter than they are. The pads of the toes, even in winter killed specimens, with hairs only on the sides, and enclosed by them, as also the pads of the soles.

Length of a specimen preserved in alcohol (in inches.)

Tip of nose to—				Tail, from anus to end of—		Length of—	
Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore foot.	Hind foot.
$1\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{2}{3}$	17	$7\frac{2}{3}$	$11\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{2}{3}$

Mustela foina, Beech marten.—As there is no American species with which the *Mustela foina* needs to be compared, it is here only necessary to say that it differs from the *M. martes*, or pine marten, in the pure white color of its gular blotch, which is forked behind, and extends on either side, in one of its branches, to the upper part of the fore feet. The body is of a more reddish yellow brown color; the chin and snout are lighter, and not different in color from the upper part of the head; the tail is brownish black, or black, from the base, with somewhat crisped hairs, and differs from the lower part of the back in color. The downy fur of all parts of the body is of a lighter whitish color. The tail is generally longer, with more vertebræ.

I am, myself, however, far from admitting the identity of the American marten with the Russian sable, although it occupies a position intermediate between the latter and the *M. martes* in size, length of tail, and coloration, as well as intrinsic value of the fur. The white headed varieties of New York are most like the sable; the darker headed ones of the western country like the pine marten. I have never seen winter specimens of the latter, nor summer of the

former, and am inclined to think that all may exhibit more white on the head in winter than summer. Many additional specimens will, however, be required to settle the question definitely.

NOTE.—A marten from Cape Flattery, received from Dr. Suckley while these sheets are passing through the press, is in tolerable winter fur, with the soles well covered with hair, except on the tubercles, which are visible. It is entirely of the pine marten pattern of coloration, not like the sable; the upper part of the head is not lighter than the back, and the reddish yellow patch on the throat is very distinct and well defined. In all points it agrees with the summer specimens from the west above referred to; a remarkable uniformity of coloring pervading all of them. Its outstretched hind feet reach within an inch of the end of the tail vertebræ; the stretched skin measures 19 inches; the tail vertebræ, 8; the entire tail, 10; the hind feet, $3\frac{1}{2}$.

I have not now the means of knowing within what limits the white headed or sable-like martens, such as I describe from Essex county, New York, are found. I am, however, still more than before, inclined to the belief that we have two species, one representing the pine marten, with dark head; the other similar to the sable, with whitish head; both, probably, distinct from the corresponding Old World species, the martens at least.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n.	Collected by
549	1668	♂ ?	Adirondac Mts, N. Y.	Feb., 1855	Dr. S. E. Hale.	-----	Skin.	-----
550	1669	♀ ?	-----do-----	-----do-----	-----do-----	-----	do	-----
460	-----	-----	Fort Boisé, O. T.	-----	Dr. Geo. Suckley.	26	do	-----
2001	-----	-----	Snoqualme river, Cascade Mts., O. T.	-----	-----do-----	118	-----	-----
1178	-----	-----	Upper DesChutes, O.T.	Aug., 1855	Lt. Williamson	-----	-----	Dr. J. S. Newberry.
1179	-----	-----	-----do-----	-----	-----do-----	-----	-----	do
2394	-----	-----	Cape Flattery, W. T.	Oct., 1856	Dr. Geo. Suckley.	139	Skin.	-----

PUTORIUS, Cuvier.

Putorius, Cuv. "R. An. I, 1817."

Teeth, 34; molars, one above, two below; premolars, three above and three below, on each side. Lower sectorial tooth without an inner tubercle. Body slender; tail usually long.

The most tangible difference between this genus and *Mustela* consists in having one molar less on each side, above and below. The size is generally smaller, and the body more slender in the typical species.

The genus includes many North American species, none of which are found in Europe. There are three distinct groups, which may be almost considered as generic, or at least as of subgeneric value. They may be characterized as follows:¹

Putorius.—Body stout; darker below than on the sides. Of this particular group America has no immediate representative.

Gale.—Body elongated and very slender. Lighter below than above or on the sides. Naked pads on the feet small, more or less hidden by the hair.

To this group belong all the American weasels, except the minks, unless the *P. nigripes* of Aud. and Bach. should prove an additional exception.

Lutreola.—Color nearly uniform all over. Feet much webbed. The naked pads on the feet large, not covered up by the hairy soles; the intervals between the metacarpal and the metatarsal pads not occupied by hairs. Posterior upper molar longer than in *Gale*.

This group includes the well known mink so similar in appearance to a small otter.

The dental formula of the true weasel is as follows: Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{3-3}$; molars, $\frac{1-1}{2-2} = \frac{16}{18} = 34$.

PUTORIUS PUSILLUS.

Least Weasel.

Putorius vulgaris, RICH. F. B. A. I, 1829, 45.

Putorius cicognani, RICH. Zool. Beechey's Voyage, 1839, 10.* (By error.)

Mustela vulgaris, MAXIM. Reise, II, 1841, 98.

Mustela pusilla, DEKAY, N. Y. Zool. I, 1842, 34; pl. xiv, f. 1.

Putorius pusillus, AUD. & BACH. N. A. Quad. II, 1851, 100; pl. lxiv.

Common weasel, PENN. Hist. Quad. 1781, No. 192.—IB. Arctic Zool. I, 1784, 75. (From N. Am. specimens in Leverian museum.)

SP. CH.—Smallest of American weasels. Length about six inches to root of tail. Tail vertebræ one-fifth to one-sixth the head and body. The terminal hairs about one-third the vertebræ, which do not exceed two inches. Tail slender, not tufted at the tip. Above, almost liver brown; beneath, white. No distinct black tip to the tail, though this is sometimes darkest.

This, the smallest species of weasel hitherto described as occurring in North America, is readily distinguishable from the rest, not only by its dimensions, but by the very short tail, which is destitute of the black tip found in all the rest, although the extremity of the tail is sometimes dusky. This member is cylindrical, thin, and, with the hairs, is about one-fifth as

¹ Wagner, Suppl. Schreber, II, 1841, 229.

long as the head and body, the vertebræ alone being about one-sixth. The specimen is not perfect enough to admit of much detail in reference to the head, ears, and feet.

The upper parts and sides are of a dark chestnut brown, much like the *Putorius noveboracensis*. This color extends on the outside of the fore legs to the wrist. The under parts, generally, as far as the anus, the feet, inside of fore legs, and of hind legs nearly to the heel, are white. The upper lip is white, bounded by a line extending from the nostril, midway between the orbit and edge of the mouth, under the ear. The tail is colored like the back, a little darker at the tip. The line separating the colors on the flanks is quite high up, though somewhat broken, there being quite as much white as brown in the middle of the body.

According to Dr. Richardson, this species becomes white in the fur countries. It is supposed to remain brown throughout the year within the limits of the United States. It is barely possible that the specimen here described may be different from the New York species, as given by Dr. Dekay.

This species is very similar to the *Putorius vulgaris* or *nivalis* of Europe, but seems still smaller, the specimen examined, though quite adult, measuring but six inches from nose to root of tail; tail, vertebræ, $1\frac{0}{2}$; tail, with hairs, $1\frac{1}{2}$ inch. The skull is broken, but the lower jaw measures six and a half lines. The colors are considerably darker than *P. vulgaris*, and the tail still shorter in proportion.

I have never seen any specimens of this weasel, except those here mentioned, which are much smaller than the ones described by Richardson and Dekay. These, however, retain much the same proportions as given by me, allowing for some stretching. Thus Richardson's specimen is given as nine inches long to root of the tail; the tail two inches to end of vertebræ, and $2\frac{1}{2}$ to end of hairs.

According to Prince Maximilian, this species becomes white in winter.

Since writing the preceding description, a specimen in alcohol has been sent from Steilacoom by Dr. Suckley, which differs in some respects. It is, perhaps, a little darker and larger, and the rather longer tail is somewhat more dusky at the tip, instead of being almost uniformly brown. The hairs project beyond the tail about one-fourth of the total length. The vertebræ of the tail are about one-fourth as long as the head and body. The feet reach to the end of the caudal vertebræ.

Measurements.

Current number.	Locality.	Tip of nose to—		Tail to end of—		Length of—		Nature of specimen.
		Occip.	Tail.	Vert	Hairs.	Fore ft.	Hind ft.	
435	Pembina. Minn.-----		6. 00	. 83	1. 08			Mounted -----
2319	Fort Steilacoom, W. T -----	1. 45	6. 00	1. 60	2. 00	. 58	. 92	Skin in alcohol.-----

This species at first was supposed to be identical with the *Putorius vulgaris* of the Old World. Dekay was the first to give it a distinct name, although he is in error as to the grounds of the separation. He places his species among the *Mustelas*, or those with three small teeth behind

the canines, instead of two, as is really the case, both in this and in *P. vulgaris*. I am not able to state its range with precision, though it appears to be a very northern species.

List of specimens.

Catalogue No. of skull.	Corresponding number.	Locality.	Whence obtained.	Nature of specimen.
435	1301	Pembina, Minn. -----	Charles Cavileer. -----	Mounted from alcohol
2319	-----	Fort Steilacoom, W. T. -----	Dr. George Suckley, U. S. A. -----	Skin in alcohol. -----

PUTORIUS CICOGNANII.

Small Brown Weasel.

Mustela cicognanii, BONAP. in Fauna Italica, Mamm. 1838. Under head of *Mustela boccamela*.

IB. Charlesworth's Mag. N. H. II, Jan. 1838, 37.

WIEGMANN's Archiv, 1839, II, 423.

Mustela vulgaris, THOMPSON, Hist. Vermont, 1842, 30.

Mustela fusca, AUD. & BACH., J. A. N. Sc. Philada. VIII, II, 1842, 288.

DEKAY, N. Y. Zool. I, 1842, 35.

WAGNER in Wiegmann's Archiv, 1843, II, 32.

Putorius fuscus, AUD. & BACH., N. A. Quad. III, 1853, 234; pl. cxlviii.

SP. CH.—Length to tail, 8 inches or less. Tail vertebræ, one-third this length. Black of tail, two-fifths its length. Outstretched hind feet reach the end of the vertebræ. In summer, brown above, whitish beneath; edge of upper lip white. In winter white; tail with black tip.

The dimensions of this species are less than those of our two ermines, although the precise limits of adult size have not yet been ascertained. The specimen before me and belonging to the Boston Society of Natural History, (kindly loaned for examination,) measures but $7\frac{1}{4}$ inches; the tail vertebræ, $2\frac{1}{4}$ inches; yet it is completely adult. The ears are broad, and the false lobe comes nearly up to the highest part of the ear. The auditory aperture is very broad. The feet are moderately large, densely coated with hair, so as to obscure very greatly the tubercles. The tail vertebræ are about one-third the head and body, or even less; with the hairs, not three-sevenths.

The general color of the back, side, legs, and tail, is rather dark brown, deepest along the vertebral line; this color is darker and with less of a chestnut-brown tint than in *P. noveboracensis*. The under parts, except as described, and the fingers and toes, are white. The white of the belly extends to the genitalia, and on the upper lip forms a narrow margin to the nose, on a line with the lower part of the nasal aperture. There is a large indistinct blotch, colored like the back, on the breast between the arms, and another behind that, though this is probably not constant. The tail begins to darken at about one-third its length from the base above, and two-thirds below; on the terminal third it is entirely black, the hairs forming a dense pencil of this color, much as in the European ermine, (*P. erminea*), this color not extending much behind the end of the vertebræ, as in *P. noveboracensis*. There are a few scattered white hairs in this brush.

A large collection of weasels made by Mr. Jenks, at Middleboro', Massachusetts, and received since the preceding description was written, has enabled me to determine with more accuracy

the characters of the species. The most important fact ascertained is that the winter pelage is entirely white, with a yellowish tinge, except the terminal two-fifths of the tail, which is black, about one-third of this on the vertebræ, the rest projecting beyond. The species, therefore, forms no exception to the general law in regard to change of color in northern ermines.

Among these specimens, various grades of color, from pure white to brown, may be observed; a common form of change is to have the tail, (except the black tip,) and sometimes the legs, white. The middle of the back is the last to change color.

The species is readily distinguished from the other American weasels by the small size, and the tail, which, with the hairs, is rather less than half the body. *P. pusillus*, nearest to it in size, has a considerably shorter tail, with the tip only slightly dusky, not black.

The *Putorius cicognanii* is one of the most strongly marked and easily identified American species, although not accurately described until this was done by Audubon and Bachman, in 1842. It was first defined, in 1838, however, by Bonaparte, as quoted above, and although he does not give any very accurate description, yet his comparisons with European species are such as to leave no doubt that he meant the animal subsequently named *P. fuscus* by Audubon and Bachman. His diagnosis is as follows:

“*Mustela cicognanii*.—*M. rufo-cinamomea*, subtus flavo-albida; cauda corporis dimidio subbreviori; apice nigricante.”

The only American species to which this description can apply is that described in the present article. Including the entire length of the tail to end of hairs, as the author does, the statement of “tail rather less than half the body,” applies exactly. The larger species have the whole tail more than half the body, while the smaller *P. pusillus* has it much less than half the body, and the tip is merely dusky, not black.

There would be no confusion whatever in the case but for the reference by Richardson, in *Zoology of Beechey's Voyage*, 1839, 10*, of *Mustela cicognanii* to his *M. vulgaris*, as given in *Fauna Boreali-Americana*. In this, however, he is clearly in error. Bonaparte, while imposing, in Charlesworth's Magazine, new names on the large ermines described in the “Fauna,” in the same article speaks of *M. cicognanii* as intermediate between *M. erminea* and *boccamela*, and places the *M. vulgaris* of Europe after *boccamela*. He also mentions expressly the distinct black tip to the tail, not found in the true *Putorius vulgaris*, nor its American analogue, *P. pusillus*, described under that name by Richardson.

The distribution of this species is not well ascertained. The Smithsonian specimens come entirely from Massachusetts, with the exception of one from Illinois.

NOTE.—Just as this article is passing through the press, a series of hunters' skins of weasels has been received from Dr. Gilpin of Halifax, among which are several that agree very well with typical specimens of *M. cicognanii* from Massachusetts. Others again, though considerably larger, preserve the same proportions in the length of the tail, as well as the other characteristics, and I cannot very well hesitate to extend the supposed limits of size, as well as of geographical distribution, considerably beyond those suggested in the preceding paragraphs. The same may be said of skins from Fort Vancouver and Puget Sound, as indicated in the list of specimens, though these are more nearly the size of those first described. Still the whole subject is one involved in uncertainty, and can only be settled by the examination of many additional specimens from numerous localities, accurately measured before skinning.

Measurements.

Current number.	Locality.	Tip of nose to—			Tail to end of—			Length of—		Height of ear.	Nature of specimen.
		Eye.	Ear.	Occip.	Tail.	Vert.	Hairs.	Fore ft.	Hind ft.		
-----	Boston -----	. 50	1. 00	1. 60	7. 25	2. 25	3. 00	. 82	1. 17	. 54	In alcohol -----
2315	Middleboro', Mass. -----			1. 60	6. 75	2. 25	3. 10	-----	-----	-----	do -----
2317	-----do-----			1. 70	7. 50	2. 35	3. 20	-----	-----	-----	do -----
2314	-----do-----			1. 85	8. 00	2. 90	4. 10	-----	-----	-----	do -----
792	-----do-----				9. 00	2. 90	4. 00	-----	-----	-----	Dry skin -----
1428	-----do-----				8. 25	2. 50	3. 40	-----	-----	-----	do -----
1427	-----do-----				10. 00	3. 00	4. 02	-----	-----	-----	do -----
794	-----do-----				8. 25			-----	-----	-----	do -----
1429	-----do-----				7. 50	2. 80	3. 80	-----	-----	-----	do -----
1082	-----do-----				8. 00	2. 60	3. 70	-----	-----	-----	do -----
793	-----do-----				9. 50	2. 60	3. 70	-----	-----	-----	do -----
1081	-----do-----				9. 00	2. 60	3. 60	-----	-----	-----	do -----

List of specimens.

Catalogue number.	Corresponding No. of skulls.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
792	-----		Middleboro', Mass. -----	Summer -----	J. W. P. Jenks -----	Dry skin, brown -----
1428	-----	♂	-----do-----	Feb. 10, 1856 -----	-----do-----	Dry skin, white -----
1427	-----	♂	-----do-----	Dec. 24, 1856 -----	-----do-----	do -----
1429	-----		-----do-----	Jan. 1, 1856 -----	-----do-----	do -----
794	-----		-----do-----	Feb., 1853 -----	-----do-----	do -----
1082	-----	♂	-----do-----	Dec. 7, 1855 -----	-----do-----	do -----
793	-----		-----do-----	January, 1854 -----	-----do-----	do -----
1081	-----		-----do-----	Dec. 21, 1855 -----	-----do-----	do -----
791	-----		-----do-----	Nov., 1855 -----	-----do-----	Mounted, brown -----
2314	-----		-----do-----	Spring, 1856 -----	-----do-----	In alcohol, whitening -----
2315	-----		-----do-----	Dec., 1855 -----	-----do-----	do -----
2317	-----		Hingham, Mass -----		T. M. Brewer -----	In alcohol, brown -----
? 298	1868		N. Illinois -----		R. Kennicott -----	Head, tail, and feet brown -----
2363	-----		Labrador, lat. 55°. -----	Winter -----	Dr. J. B. Gilpin -----	Hunter's skin -----
2361	-----		-----do-----	do -----	do -----	do -----
2359	-----		-----do-----	do -----	do -----	do -----
2360	-----		-----do-----	do -----	do -----	do -----
2362	-----		-----do-----	do -----	do -----	do -----
? 2364	-----		-----do-----	Summer -----	do -----	do -----
2365	-----		Nova Scotia -----	do -----	do -----	do -----
? 2054	-----		-----do-----	Winter -----	do -----	do -----
2395	-----		Puget sound -----	do -----	Dr. George Suckley -----	do -----
965	-----		Vancouver's island. -----	do -----	Lt. W. P. Trowbridge. -----	do -----

PUTORIUS RICHARDSONII.

Mustela richardsonii, BONAP. in Charlesworth's Mag. N. H. II, Jan. 1838, 38. ("M. erminea, RICH. F. B. A.")

Putorius richardsonii, BR. in RICH. Zool. Beechey's Voyage, 1839, Mammalia, 10.*

Mustela (Putorius) erminea, RICH. F. B. A. I, 1829, 46.

Mustela erminea, THOMPSON, Hist. Vermont, 1842, 31.

Putorius agilis, AUD. & BACH., N. A. Quad. III, 1853, 184; pl. cxl.

SR. CH.—Length to tail, 9 inches or less. Tail vertebrae about half this length. Black of tail nearly one-half to one-third its length. Outstretched hind feet reach to the middle of the tail, (with hairs,) or a little beyond. In summer, dark chestnut brown above; whitish beneath. Whole upper jaw brown. In winter, white. Tail with black tip.

A specimen in alcohol, which I refer to this species, is much smaller than skins of *P. noveboracensis*, though perfectly adult. Its colors, moreover, are darker than in the larger species. It was caught in the spring of 1855, and consequently may be considered as having attained its full growth. The ears are large and somewhat pointed; the false lobe, however, does not extend very high up. The centre of the eye extends rather more than midway between the nose and anterior edge of the ear opening. The feet are moderately large; their under surfaces not very densely furred, allowing the tubercles to be readily visible. The hind feet outstretched reach midway along the vertebrae of the tail; these vertebrae being more than half the length of body, with the hairs, about five-eighths.

The upper parts are of a dark chestnut brown, with but little reddish, this color pervading the tail, perineal region, legs and feet. The under parts are white, though much restricted; the line of separation quite low down, beginning at the angle of the mouth, not on the upper jaw or nostrils, and extending on the inside of the fore leg to the wrist, and on the thighs. The flattened tail throughout is darker than the back, on its upper surface, and the gradation into the black tip imperceptible, although the terminal half above, and nearly as much below, are entirely black. The hairs at the end of the tail, though long, do not, in this summer specimen, form a brush as in some other species; indeed, the tail in the parallelism of its sides and depressed shape is not dissimilar to that of *Tamias*.

In an alcoholic specimen from Middleboro', (2316,) of rather small size, the body is seen to be of very slender and delicate proportions, much resembling those of *P. cicognanii*. The vertebrae of the tail are about half as long as the head and body. The outstretched hind feet reach to the middle of the tail, hairs included. The tail is decidedly depressed, and distichous. The colors are much as in the Boston specimen. The upper lip is entirely brown, without white edge, as in other ermines. The legs are entirely brown. The black tip to the tail is nearly half its length on the under side.

The feet are much smaller, more slender and delicate than in the *P. noveboracensis*; the tubercles larger. Although actually larger in body, the feet are relatively smaller than in *P. cicognanii*. The tail, of course, is considerably longer. The ears are higher and narrower at the base than in the last mentioned species.

A summer specimen from Steilacoom (654) agrees very well with those from Massachusetts, excepting in having the peculiar reddish tinge to the under parts, so generally seen in western weasels. The whole upper lip is brown.

A much stretched winter skin from Halifax, N. S., decidedly larger than No. 2316, appears to belong to this same species. It is pure white, with a strong sulphur yellow tinge beneath,

and on the posterior portion of the back. The tail is full and rather bushy, the vertebræ measuring 3.90 inches; with the hairs, 5.60. The black tip is very well defined, and occupies nearly one half the total length of the tail. The end of the vertebræ extends a little beyond the first third of this black portion. In the character of the tail, it resembles the European ermine more than *P. noveboracensis* does; its tail is, however, more slender and longer; the black less extended in proportion to the white. It is, however, quite possible that this specimen may belong to *P. cicognanii*, (see this species;) and that the latter species, in higher latitudes, attains a greater size than it does in Massachusetts.

The species is readily distinguished from *Putorius cicognanii* by the longer tail, the vertebræ alone of which are half the length of the body, instead of requiring the entire tail to effect the same proportion. It is much smaller and darker than *P. noveboracensis*, and the whole upper lip is brown.

The *Mustela agilis*, of Tschudi, Fauna Peruana, 1844-46, p. 110, (not of Audubon & Bachman,) is very slender in form, with a small and pointed head; the tail much shorter than the body. The head, back, and tail are reddish gray; the latter a little darkest at the tip. The under parts generally are grayish white. The base of the hairs above is gray; then follows a broad grayish yellow ring, succeeded by a reddish brown tip. The head above is either entirely dark brown or with a white border to the upper lip. The length of body to root of tail, 9.10 inches; the tail, 4.4½ inches; the head 1½ inches.

This species, a true *Putorius*, differs materially from the larger North American weasels, in the absence of a black tip to the short tail; in this respect resembling the *Putorius cicognanii*. It probably bears a near resemblance to *Putorius boccamela*, of Italy. The lack of white or yellow blotches on the forehead distinguishes it from either *P. frenata* or *xanthogenys*. It inhabits the barren, cold plateaus of the Peruvian Cordilleras, and is the only true weasel well established as inhabiting South America.

The measurements and other indications of Richardson, as well as the comparison with a larger variety, together with the known facts of the more Arctic distribution of the smaller long tailed ermine, leave no doubt on my mind that the common ermine, as described by Richardson, is really the *Putorius agilis* of Audubon & Bachman. The name of Bonaparte has priority over the last mentioned one, which would at any rate be untenable, as it had been applied previously by Tschudi to a Peruvian species, as already mentioned.

The geographical distribution of this small ermine, as shown by the accompanying list of localities, is very extensive, and it appears to range much further to the north than the large species. Richardson describes a specimen obtained at Fort Franklin, Great Bear Lake, latitude 65° 11' 56" N. The Smithsonian collection embraces specimens from Halifax to Vancouver's Island, and as far south as Massachusetts. Its extreme southern range in the Atlantic States is not yet ascertained, though it is probably replaced there by the *P. noveboracensis*.

Some objection may be made to the identification of this species with that described by Richardson, on the ground that he gives the length at eleven inches. A skin of nine inches might very readily be stretched to that length, and the fact is proved by the measurements of the tail, which are, vertebræ four inches, and with hairs five. The largest American ermine weasels I have ever seen, before being skinned, measured less than eleven inches, even when the tail vertebræ were five or six inches long.

Measurements.

Current number.	Locality.	Tip of nose to—				Tail to end of—		Length of—		Black tip to tail.	Nature of specimen.
		Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.		
2316	Middleboro', Mass.	. 55	1. 05	1. 90	8. 00	4. 00	5. 10	. 90	1. 35	2. 15	Alcohol ...
-----	Boston	. 56	1. 05	1. 83	8. 25	4. 25	5. 25	. 95	1. 42	-----	do.

List of specimens.

Catalogue number.	Sex & age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
2316	♀	Middleboro', Mass.	April, 1855 ...	J. W. P. Jenks.	-----	In alcohol; brown.
-----	-----	Boston, Mass.	Spring, 1855...	T. M. Brewer	-----	do.
? ? 2054	-----	Halifax, N. S.	Winter.	Dr. J. B. Gilpin	-----	Dry skin; white.
654	-----	Fort Steilacoom	Summer, 1854.	Dr. George Suckley ..	20	Dry skin; brown.

PUTORIUS NOVEBORACENSIS.

Common Weasel; White Weasel.

Putorius noveboracensis, DEKAY, N. Y. Zool. I, 1842, 36; pl. xii, f. 2; pl. xiv, f. 2.
Putorius erminea, AUD. & BACH. N. A. Quad. II, 1851, 56; pl. lix.

SP. CH.—Length to tail about ten inches. Tail vertebræ about half this length. Black of tail, one-third its length. Outstretched hind feet reach not quite to the middle of the vertebræ. In summer, chestnut brown above, whitish beneath. Edge of upper lip white. In winter, white, tail with black tip.

The precise determination of the North American weasels is a matter of very considerable difficulty, owing to the close relationship existing between them and the absence of any minute comparisons of the allied species, both American and European. It is by no means improbable that an examination of large numbers of specimens from remote localities will bring to light several additional species, while at the same time greatly extending the range of those at present known.

I am not now prepared to say whether the true ermine, *Putorius erminea*, is found in any part of North America, but doubt very much whether it exists even in high northern localities. All the specimens collected within the limits of the United States by the different expeditions are clearly distinct from *P. erminea*, as will hereafter be shown.

None of the specimens at my command admit of any very nice distinctions as to proportion of toes, number and extent of naked pads on the feet, length of tail and ears, &c. The head is depressed and acute; the ears large and extending far around the auditory aperture. The tail, as well as can be ascertained from the skin, has the vertebræ about half the length of the body, the hairs

projecting in no case more than an inch and a quarter beyond. The tail is cylindrical, quite thickly clothed with fur, and tipped with black for about twice the length of the longest terminal hairs.

Summer dress.—Not having before me a specimen taken in summer, I shall be obliged to make use of one killed December 15, 1848, at Carlisle, Pennsylvania, where this species does not change to white in winter. It is not likely that any material change has taken place from the summer dress, beyond, perhaps, a greater intensity of coloration and a fuller and softer condition of the hair. In this specimen the upper parts and sides are of a rich and rather dark chestnut brown, deeper towards the back and on the dorsal line of the tail. The under parts are of a yellowish white, palest on the chin, and tinged with delicate straw color under the body. The line of demarcation between these colors is quite low down the sides, beginning at the angle of the mouth, (the extreme edge of the lips only being white,) and extending quite low down on the flanks. On the neck the brown occupies two-thirds of the entire circumference, and on the middle of the belly, five-sixths. From this region, however, the white widens to the fore and hind legs, extending along their inner surfaces to about opposite the wrist and the knee, where the color runs out to a point. The limbs are thus entirely and uniformly like the back, with the exception of the light spur which runs down their inner faces from the abdomen. The light color of the abdomen does not extend as far as the arms, the region about which, with the entire tail, is brown. There are no light marks on the ears. The dark tip of the tail occupies from one-third to one-fourth of its entire length, the end of the vertebræ falling about in its middle.

A specimen from Fort Smith, Arkansas, is similar in all essential respects, although of a reddish yellow beneath.

A specimen in alcohol, from Massachusetts, is rather smaller, perhaps, than the average, but of sufficient size to have it represent this species, has the feet very large and strong. The hind foot is one-third the length of the vertebræ of the tail. The feet are densely furred, so as to hide the tubercles to a considerable extent. The dusky of the tail covers more than its terminal third. This specimen is labelled as collected in winter, but exhibits no signs of change. The outstretched hind feet reach not quite to the middle of the tail. About two-thirds of the black tip to the tail project beyond the vertebræ.

I have before me no pure white ermines from the eastern States. A very large skin from Essex county, New York, (835,) is in a transition state, the under fur, generally, being white, and only the long hairs towards the middle of the back retaining their summer color. The terminal third of the tail is black, the end of the vertebræ falling about in the middle of it.

It is quite probable that this species retains its color throughout the season to a considerable range northward, more so, indeed, than *P. fuscus*, originally supposed not to change at all.

The principal points of difference between this species and *P. richardsonii*, (*P. agilis*, of Aud. and Bach.,) are the considerably larger size and disproportionately large and broad feet, the hinder of which measures $1\frac{3}{4}$ inches, or nearly half an inch more than in the other. There appears to be a pretty constant character in the white margin to the upper lip, which I have not noticed in the other, although it may occasionally be present.

The much larger size and the longer tail, distinguish it at once from *P. cicognanii*. Its relationship to *P. longicauda* will be referred to under the head of that species.

In comparing specimens of this species with the *Putorius erminea* of Europe, notwithstanding the assurances of authors, very decided points of distinction are readily discernable. Of these

the most striking is to be found in the tail, which (including the hairs) in *P. erminea* is about as long, or a little longer, than half the body. The hairs on the extremity are very long and bushy, measuring from one inch and three-quarters to two inches and a half, and being nearly two-thirds as long as the tail vertebræ, which, in fact, are only one-fourth the length of head and body. In *P. noveboracensis*, on the other hand, the vertebræ, exclusive of the hairs, are nearly half the length of the body; the projection beyond the tip, from one inch to one inch and a half, or about one-fourth of the length of the vertebral portion. I am unable to make any actual comparison of the feet, owing to the shrivelled condition of all the specimens on hand. The ears of the American species appear decidedly larger. The naked portion of the nose is larger also, and the septum is broader and descends further towards the mouth. The coloration again is decidedly different, in the much greater extension of the light colors over the lower parts in *P. erminea*. Here the line of separation is higher up on the flanks, while the inside of all the limbs, the entire feet, and the under surface of the tail, including the region of the groin and nates are yellowish white. In the American species the entire limbs, except the upper portion of their interior surfaces, the nates, groin, and entire tail, except at the tip, are chestnut brown, like the back. The black of the tail begins more abruptly in *P. erminea*, at a short distance before the end of the vertebræ, while in the other the tip of the vertebræ falls in about the middle portion. In *P. erminea* again, the dividing line of color passes high up on the cheek, nearly bisecting the side of the head, and passing but a short distance below the orbit, (about half its diameter,) the whole upper lip being white. In the American species this line is much lower down or on a level with the angle of the mouth, only a small edging of the upper lip being white. I have not noticed in any American specimen the white edging of the ears seen in Swedish specimens. This may, however, be merely an incipient change of coloration. The winter dresses differ in the greater comparative extent of the black tip to the tail in *P. erminea*.

The skeleton of No. $\frac{17}{624}$ from Carlisle, has of vertebræ: seven cervical, fourteen dorsal, six lumbar, four sacral, and twenty-one caudal=fifty-two. It differs from most weasels in having four sacral vertebræ, and from *P. erminea* in possessing twenty-one caudal vertebræ instead of nineteen—three more vertebræ in all. The caudal vertebræ, applied along the back, extend from their base to the first dorsal vertebræ. Skeletons of *P. vison* and *P. frenata*, show but three sacral vertebræ, as in most species, with the probably necessary assignment of all the far western large ermine weasels of America to the *Putorius longicauda*, the range of *Putorius noveboracensis* becomes much more limited than heretofore supposed, especially if the northern one be the *Putorius richardsonii*. Thus far we cannot trace it north of Massachusetts nor west of Wisconsin. Fort Smith, Arkansas, and Pennsylvania, are the more southern localities. It probably extends through most of the southern and southwestern States.

I have seen no pure white skins of this weasel, and do not feel sure that it changes except in the most northern portions of the United States.

I do not consider it as by any means certain that Dekay in his article on *P. noveboracensis* does not describe, at least in part, the *P. richardsonii*. The figure of the winter specimen is almost exactly this last species. The description and figure of the summer specimen give no indications of any white border to the upper lip. If this be really a character of *P. richardsonii*, it will settle the question. In the necessary uncertainty it will be best, however, to retain and strengthen the name of Dekay, rather than to reduce it to a synonym by the application of a new one.

Measurements.

Current number.	Locality.	From tip of nose to—				Tail to end of—		Length of—		Dusky of tail.	Skull.	Nature of specimen.
		Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.			
1413	Boston, Mass..	.70	1.55	2.14	10.30	5.20	6.60	1.30	1.75	2.70	-----	In alcohol ..
2313	Illinois	-----	-----	2.10	8.50	4.20	-----	1.10	1.50	-----	-----	-----
17	Carlisle	-----	-----	-----	11.00	5.50	6.92	-----	-----	-----	1.93	Skin

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
17	624	♂	Carlisle, Pa.....	Dec. 15, 1845	S. F. Baird	Skin
835	-----	-----	Elizabethtown, N. Y.	Nov. 1854	do	do
1412	-----	-----	Saranac Lake, N. Y.	Summer	M. Baker	do
1413	-----	-----	Boston, Mass	Winter, 1855	Dr. T. M. Brewer....	In alcohol ..
2313	-----	♀	Illinois	-----	R. Kennicott	do
434	-----	-----	Racine, Wis	-----	A. C. Barry	Mounted ...
2318	-----	-----	Bradford county, Pa	-----	C. C. Martin	Skin in alc'l.
436	1302	-----	Fort Smith, Ark	-----	Dr. G. G. Shumard...	Mounted ...

PUTORIUS LONGICAUDA.

Mustela longicauda, BONAP. in Charlesworth's Mag. N. H. II, Jan. 1838, 38. (Based on Richardson's description.)

Putorius longicauda, RICH. (ex BONAP.) Zoology Beechey's Voyage to Pacific, 1839. Mammalia, 10.*

Mustela (Putorius) erminea, RICH. F. B. A. I, 1829, 46. ("Carlton House variety, with long tail.")

SP. CH —Length to tail about eleven inches. Tail vertebræ about half this length. Black of tail about one-fourth its length. Above, light olivaceous brown; beneath, brownish yellow; edge of upper lip and chin white. In winter, white; tail with black tip. Light space on belly much wider than in *P. noveboracensis*. Muzzle broad.

This species, which belongs to the section of ermine weasels, is larger than any of its congeners, excepting the American ermines. Like the *P. nigripes* of Aud. and Bachman, it is characterized by the breadth of the muzzle, as very distinctly shown in the skull. The hair is everywhere remarkably stiff, coarse, and short, fully equalling in this respect the fur of *P. frenata*. The ears are rather short and low, the meatus quite concealed by stiff, bristly hairs. The naked portion of the muzzle is large and prominent.

The vertebræ of the tail (as ascertained before skinning) are nearly half the length of the head and body, ($5\frac{1}{2}$ and $12\frac{1}{4}$ inches; the hairs $6\frac{5}{8}$ inches.) The hairs of the tail are stiff, long, and bristly, though rather sparse; the brush at the end fuller than in *P. noveboracensis*, less so than

in the European *P. erminea*. Their projection beyond the vertebræ is about one-fifth of the length of the caudal vertebræ.

The feet are large, the claws well developed. As usual there are ten naked balls on the fore feet, and nine behind. The under surfaces of the feet are sparsely covered with hair, as is generally the case with the weasels in summer.

The predominating color of this species above is of a yellowish chestnut brown, considerably lighter than in the *P. noveboracensis*, and much resembling the colors of *P. frenata* and *xanthogenys*. From these, however, it is easily distinguished by the absence of light patches on the cheeks and forehead.

The under parts are of a pale brownish yellow; nearly white about the chin and cheeks, and more vividly yellow along the thighs. The line of separation between these colors is quite indistinct; indeed the bases of the hairs above, and the whole of the subjacent fur are yellowish, like the belly, the chestnut tinge being imparted by the tips of the hairs. As far as can be traced in this uncertainty of outline, the darker color extends on the outside of the arm only to about the elbow; the remainder of the fore leg being like the belly; on the hind feet it extends along the outside of the limbs to the toes, the upper surface of the feet being yellowish. The upper surface of the tail is like the back; beneath it is yellowish chestnut, darker than the belly; the tip for about two inches is lustrous black; the color commencing not much posterior to the end of the vertebræ.

The line separating the colors of the upper and under sides passes quite high up on the flanks; the paler portion occupying fully two-fifths of the entire circumference around the middle of the body. On the neck it occupies fully three-fifths of the circumference. The white of the cheeks extends horizontally along the upper lip to the nostrils; passing under the eye, at a distance about half way between the eye and the mouth.

As stated, this specimen is of very large size. When fresh, the head and body measured $12\frac{1}{4}$ inches; as a preserved skin, with no unusual amount of stretching, it is rather more than 15 inches; the tail vertebræ now measure $5\frac{3}{4}$ inches; with the hairs, $7\frac{1}{4}$ inches. These dimensions are considerably larger than in the *P. noveboracensis*. The end of the skull is much broader than in this species or in the ermine of Europe, although the teeth are of the same size (more widely separated). The posterior upper molar is even narrower than in skulls of *P. noveboracensis*, of much smaller size. Its much lighter tints above, and the greater extent of the paler color of the under parts, (over all the legs, beneath the base of the tail, upper lip, &c.,) with the stiffer hairs, as well as its size, distinguish it from the other described American ermines. The tail is much longer and with a shorter brush than in the European ermine. In some respects it resembles the *P. nigripes*, Audubon and Bachman, but is smaller, has a longer tail, is without the black of the head and feet, &c.

The specimen described was taken on Milk river, upper Missouri, by Dr. Suckley, in August, 1853. Whether it turns white in winter is not known.

Measurements. $\frac{225}{1873}$, *Milk river, Nebraska.*

	Fresh speci- mens.	Skin.
	Inches.	Inches.
Head and body.....	11	15 $\frac{1}{4}$
Tail vertebrae.....	5 $\frac{1}{2}$	5 $\frac{1}{2}$
Tail to end of hairs.....	6 $\frac{5}{8}$	7
Circumference of head at ears.....	4 $\frac{5}{8}$	.....
Circumference of throat under shoulders.....	4	.....
Circumference of loins.....	4	.....
Fore arm to wrist.....	1 $\frac{1}{8}$	.....
Femur.....	1 $\frac{1}{8}$	.....
Tibia.....	1 $\frac{1}{4}$	.....
Longest claw of fore foot.....	.....	$\frac{1}{4}$
Distance between upper incisors, (outside).....	.....	1 $\frac{4}{10}$

Smaller specimens from the Missouri river and west differ from *P. noveboracensis* in a greater extent of the light color on the belly, and in having this of a very decided pale saffron yellow. The chin and under surface of the head, however, are white. The upper parts are lighter, and with a greenish tinge. Winter specimens are pure white, with black tip to the tail.

Their general appearance is much the same with that of number 225, although they are smaller; the shade of brown above, and other features, are very similar. There is nearly the same indistinctness in the line of separation between the colors of the back and belly, the more yellowish tinge generally. The light color of the belly is considerably wider in all these than in *P. noveboracensis*.

If all the specimens of long tailed ermines from the Missouri region differ from the New York species, as I am inclined to suspect, then it is the more probable that they are the same with the Carlton House variety with long tail, referred to in Richardson's Fauna Boreale-Americana, as quoted above. I have little doubt that the two large species I describe are different; should they prove the same, however, then Bonaparte's name must be retained as having priority.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	From tip of nose to—		Tail to end of—		Collected by—
								Occip.	Tail.	Verteb.	Hairs.	
225	1873	.....	Milk river, Up. Mo.	Aug., 1853...	Gov. I. I. Stevens.	.....	Skin.....	.....	.....	.....	.....	Dr. Geo. Suckley.
1878	2576	♂	Laramie river, Neb.	Aug. 4, 1856	Lt. F. T. Bryan...	207	...do.....	2.38	10.60	5.13	5.70	W. S. Wood....
1879	2577	♂	do.....	Aug. 5, 1856	do.....	210	...do.....	2.38	10.75	5.75	7.25	do.....
1756	.....	.....	Long Lake, Neb....	Oct., 1856....	Lt. G. K. Warren.	.....	...do.....	.....	.....	.....	.....	Dr. F. V. Hayden.
1757	.....	.....	Yellowstone.....	Aug., 1856...	do.....	.....	...do.....	.....	.....	.....	.....	.....do.....
?1758	.....	.....	Fort Clark, Neb....	Winter.....	do.....	.....	Skin; white..	.....	.....	.....	.....	.....do.....
?1759	.....	.....	.....do.....	do.....	do.....	.....	...do.....	.....	.....	.....	.....	.....do.....

PUTORIUS KANEII, Baird.

Kane's Ermine.

SP. CH.—Length to tail, about $8\frac{1}{2}$ inches. Tail vertebræ about one-sixth this length. Black of tail, one-half the total length. In summer, brown above; edge of upper lip whitish. In winter, white; tail with black tip.

Among the collections of the North Pacific and Behring's Straits Expedition is a weasel, found in large numbers in the Tchucktchi country, which, though much smaller than the true old world ermine, is yet a perfect miniature of it. If *Putorius agilis* and *noveboracensis* be really distinct, the same law would hold good in regard to the specimen in question and the large ermines. The feet are small, with the naked balls quite distinct. The tail is very short, the vertebræ extending only about half an inch beyond the outstretched hind feet; it is tipped with long hairs, forming about two-fifths the total length, and more than half the vertebral portion. The black tip on the under surface is fully half the total length of the tail.

The fur is soft and fine; above of a rather dark chestnut brown; beneath, sulphur yellow; the under part of the head, and a wide margin to the upper jaw, are white. The feet are yellowish white, but there is no white about the ears.

A winter specimen, 1458, from Semipalatinsk, Siberia, is very similar in size and the characters of the tail. The black extends further on the tail. The whole remaining color is pure white, with a sulphur tinge in places.

Compared with summer specimens of the ermine from north Sweden, the size is much less; the tail perhaps a little longer, the terminal hairs shorter; the black tip less extensive, occupying not more than half the total length, instead of nearly two-thirds. The end of the vertebræ falls considerably in advance of the posterior third of the black tip, instead of considerably behind it as in *P. erminea*. The winter specimen differs in about the same characters.¹

The animal is about the size of the American *P. cicognani*, which it otherwise greatly resembles and represents. The tail is, however, shorter, thicker, and the terminal hairs are longer; the black tip occupies, likewise, a larger portion of the tail.

As the most Arctic mammal it may ever be my privilege to name, and especially as an ermine, the emblem of spotless purity and integrity, I propose to call it after Dr. Kane, the devoted martyr to the cause of science and humanity, and thus impose upon it an appellation which will be understood and appreciated in whatever portion of the world this description may be read. If Bonaparte were justified in calling an American animal after an Italian patriot, surely we may be pardoned for commemorating in a similar manner one who in his life combined the highest attributes of the hero, the patriot, the scholar, the Christian gentleman, and the devoted relative and friend; one whose memory will ever be fresh in the hearts of his countrymen—himself by acclamation a citizen of the world.

The following proportional measurements will illustrate the relation between this species and the *P. erminea*.

¹ For purposes of comparison with this and other species, I give the following diagnosis of the European ermine:

P. erminea.—Length to tail about ten inches. Tail vertebræ about one-fifth this length. Black of tail two-thirds its total length. Terminal caudal hairs very long. Above, olivaceous brown. In winter, white. Tail with long black tip.

Measurements.

	<i>P. kaneii.</i>		<i>P. erminea.</i>
	2330.	1458.	382.
Tip of nose to tail.....	8. 50	8. 50	10. 50
Tail to end of vertebræ.....	2. 60	1. 90	2. 75
Tail to end of hairs.....	4. 00	3. 40	5. 00
Hind foot.....	1. 35	1. 35	1. 90
Black of the tail.....	2. 00	1. 80	3. 40

List of specimens.

Catalogue number.	Locality.	When collected.	Whence obtained.	Nature of specimen.
1458	Semipalatinsk, Siberia.....	Winter.....	Dr G. Hartlaub.....	Skin.....
2330 ¹	Tchucktchi county, Kamtschatka.....	Summer.....	Capt J. Rodgers, U. S. N.....	do.....

PUTORIUS FRENATUS.

Bridled Weasel.

Mustela frenata, LICHT. Darstell. Säugt. 1827—1834; pl. xlii.

AUD. & BACH. J. A. N. Sc. VIII, II, 1842, 291.

Mustela frenata, GRAY, Zool. Sulphur, 1844, 31; pl. ix. (Head.)

Mustela (Gale) frenata, WAGNER. Suppl. Schreb. Säugt. II, 1841, 234.

Putorius frenata, AUD. & BACH. N. A. Quad. II, 1851, 71. (Plate ix.?)

?? "*Mustela brasiliensis*, SEWAST. Mem. Acad. St. Petersb. IV, 1811, 356; tab. iv."

"D'ORB. Voyage Amer. Mer. Mam; pl. xiii, f. 3, skull."

SP. CH.—Tail vertebræ rather more than half the length of body; the terminal hairs one-fifth to one-sixth this length. Head above, dark brown, nearly black, with three white marks, one between the eyes, and another in advance of each ear. Above, chestnut brown; beneath, yellowish white. Tail tipped with black.

The body of this species is slender and elongated; the limbs rather short; the tail vertebræ rather more than half the length of the body. The ears are moderately long and high, coated with hair on both sides; more or less naked within the meatus. The posterior edge of the ear is split into two laminae, as usual in the weasels. The eye is rather large, its centre situated about half way between the nose and the anterior edge of the meatus. There are seven folds of the gum, of which the anterior two are convex anteriorly; the next three bow-shaped, or in a double curve; all five continuous across the palate, except, perhaps, the last one; the posterior two are likewise convex anteriorly, but interrupted in the centre. There is also a pair of

¹ Collected by Mr. Stimpson on the island of Arikamitchichi, in Behring Straits, who informs me that of many specimens seen, all were of this diminutive size.

caruncles between the sixth and seventh, near the median line. The feet are broad, and the digits connected by a thickened skin, which extends nearly to the end of the second phalanx. There are ten naked balls on the fore foot, five at the ends of the fingers, four on the palm, and one on the wrist. When the fingers are all drawn up, there are seven balls on the exterior of the hand, two inside, and one posterior to all the others. The bulb situated at the base of the third and fourth fingers is much larger than the rest, and may be considered as formed by the union of two bulbs. The four palmar bulbs are not separated by hairs. The skin between these and the posterior bulb, as well as between these and the fingers, is covered with dense hairs. There are nine naked balls on the hind feet, the posterior one being wanting, the arrangement of which is precisely similar to that of the fore feet. The third digit of both feet is longest; then fourth, second, fifth, and first.—(Taken from a specimen in alcohol.)

The prevailing color of the upper parts and sides is a chestnut brown; the lower parts generally yellowish white, with occasionally a tinge of brownish. The line of separation passes a little below the middle of the sides all the way from the ear to the hind legs. The inside of the limbs, the whole hands, and the inner edges and toes of the hind feet, brownish white. The under surface of the head is of a purer white, this color also running out to a point, from the angle of the mouth along the edge of the lip to about opposite the canines. The head, including the ears and a slight suffusion on the sides of the neck, are rich blackish brown, with a triangular patch of whitish in the middle of the forehead, between the eyes, and another on either side still larger, running obliquely forwards to this spot in advance of the ear and confluent with the paler under parts. In some specimens these three patches are connected, thus entirely separating the dark brown muzzle, orbital region and cheeks from the sinciput. The tail is colored like the back, (a little paler beneath,) with about two inches of the tip dark brownish black.

In none of the specimens before me are the under parts pure white, as described by Lichtenstein; all the adults have, however, been preserved in alcohol, which is well known to alter white to yellowish. One or two specimens, indeed, are bright gamboge yellow beneath; otherwise, among nine specimens before me, there is little or no variation either in tint or pattern.

The measurements in the annexed table are all taken from specimens preserved entire in alcohol, and of dimensions representing the very old, half grown, and very young stages. The proportional dimensions will be seen to vary considerably, the tail becoming decidedly longer in the adult. Most prepared skins give an inaccurate idea of size, owing to the great extensibility of the neck in the weasels. Thus a skin from Ringgold Barracks measures thirteen inches in length of head and body; tail to end of vertebræ, $6\frac{8}{12}$; to end of hairs, $7\frac{9}{12}$; yet it is evidently no larger than the largest specimen given in the table, probably not so large.

General dimensions. Specimens in alcohol.

	Inches.	Lines.	Inches	Lines.	Inches.	Lines.
Nose to occiput	2	9	1	11	1	8½
to eye				7		6½
to ear				13		12
to root of tail	11	8	7	2	6	
to end of outstretched hind legs	14	2	9	8	8	2
Tail, from root to end of vertebrae	6	9	3	7	3	1
from root to end of hairs	7	10	4		3	4½
Ears, height internally above skull		5		4		3
width at base		10		9		6½
Arm, between claws across shoulders	10	3				
length of humerus	1	8½				
from elbow to end of claws	2	6	1	10	1	6½
fore foot	1	3	1			8
Leg, from knee joint to end of claws	3	8	2	4	2	
tibia	1	10½	1	1½	1	
hind foot from heel to end of claws	1	9	1	4½	1	1

This species is readily distinguishable from its American congeners, except *P. xanthogenys*, by the singular patch of yellowish white on the forehead, and another anterior to each ear. It is quite abundant about Matamoras and Brownsville, Texas, although it does not appear to range further north, at least it has not been noticed in Texas except on the Rio Grande. Mr. Clark procured a very fine specimen at Ringgold Barracks.

A specimen from the city of Mexico agrees rather better with the description of Lichtenstein. The head is black considerably behind the ears; the under part almost pure white to the middle of the belly, where a reddish tinge is visible. In size it is much less than Rio Grande specimens, the feet not more than half as large as No. 200.

The following are the measurements of the specimen described by Lichtenstein.

Measurements.

	Inches.	Lines.
Length from nose to tail	11	6
Tail to end of vertebrae	6	4
Tail to end of hairs	7	2
Hind foot from heel	1	7

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	Whence obtained.	Nature of specimen.	From tip of nose to—		Tail to end of—		Length of hind feet.	Collected by—
						Occip.	Tail.	Verteb.	Hairs.		
1060	.....	.....	City of Mexico	John Potts.....	Skin .....	.....	10.40	5.60	6.70	1.49	.....
200	1177	.....	Ringgold Barracks	Maj. W. H. Emory.....	do .....	.....	.....	.....	.....	.....	John H. Clark.....
239	.....	○	Matamoras, Mexico.....	Lt. D. N. Couch	do .....	.....	.....	.....	.....	.....	Dr. L. Berlandier...
601	1724	○	do	do	do	2.25	10.33	6.08	7.50	.....	.....
602	1725	♂	do	do	do	2.00	8.25	4.66	5.00	.....	.....
2320	.....	○	do	do	do	1.92	6.76	3.75	4.15	1.34	.....
2321	.....	○	do	do	In alcohol.....	1.72	6.00	2.90	3.16	1.15	.....
2322	.....	♀	do	do	do .....	.....	12.00	6.75	8.92	1.70	.....
2323	.....	○	do	do	do	2.18	7.15	4.75	5.28	1.45	.....
2324	.....	○	do	do	do	1.75	6.63	3.30	3.66	1.15	.....
2325	.....	○	do	do	do	1.25	5.80	1.30	1.60	.80	.....

PUTORIUS XANTHOGENYS.

Yellow Cheeked Weasel.

Mustela xanthogenys, GRAY, Ann. and Mag. N. H. XI, 1843, 118.—*Id.* Zool. Sulphur, 1844, 31; pl. ix.

SP. CH.—Similar to *P. frenatus*. Tail vertebræ about half the length of the body; the hairs about one-eighth this length. Head chestnut brown, little darker than the back; the three patches on the face reddish yellow; body chestnut brown above, reddish white beneath; tip of tail black.

This species is closely related to *P. frenatus* in general characteristics of tint and pattern of coloration. The ears are rather more acute than in *P. frenatus*, and not so broad at the base. The toes are longer and less fully webbed; the under surfaces of all the feet more densely furred. There are ten balls on the fore feet, but these are smaller than in *P. frenatus*; of the nine on the hind feet, two or three on the soles can with difficulty be made out, owing to their being buried in the fur; the interspaces between all have short stiff hairs, instead of being nearly naked. This may, however, depend somewhat on the season. The tail, though mutilated, is apparently about half the length of the body.

The upper parts and sides are of a chestnut brown color; beneath, of a dull brownish or rusty yellow. The chin is of a paler tint. There is a yellowish spot on the top of the muzzle anterior to the eye, and a patch of the same commences acutely about midway on the edge of the upper lip, and passes in a sub-crescentic direction behind the eye, about half way between it and the ear, though not getting as high as the upper edge of the latter. The whole space between the ear and the border just described is occupied by this color. There is a dusky spot on each side of the lower jaw. The upper part of the head is a little deeper in color, though far from having the intensity of *P. frenata*. The tail is like the back, dusky at the tip.

In the arrangement of the patches on the head, this specimen differs materially from *P. frenatus*, as compared with nine specimens from Matamoras. The frontal patch is of much less extent, and situated considerably further in advance of—not between the eyes—but on top of the nose. The brown mask on the side of the head, instead of extending backward in an acute point for twice the length of the lower jaw nearly to the ear, and with its upper edge parallel with the base of the ear, as in *P. frenatus*, is quite abruptly truncated by the light patch, which is thus broader at the base, but does not extend so high up. The under parts have a good deal

more of a reddish yellow tint. The other differences, as stated, consist in the smaller feet more fully furred beneath, more acute ears, shorter tail, &c.

Many additional specimens of this species have been received from California since the preceding article was written, and although some of them indicate an approximation to *P. frenatus*, yet they all admit of being readily separated. No. 1352, from San Francisco, has the anterior portion of the head, as far back as the occiput, darker than the rest of the body, but it is far from being black, nor does it extend back of the ears. The frontal blotch is yellowish white, not pure white, and the lateral one is truncated behind, as described. The tail is not very long. All the other specimens have even less brown on the head, and the yellow of the face is brighter. The species thus far appears to be confined to the California coast.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of hind foot.	Black tip of tail.	Collected by—
1601		San Diego, Cal.....	Apr. 22, 1856	Dr. J. F. Hammond....	Skin	10.30	5.00	6.80	1.45	2.00	.....
1602		do	do	do	do	12.00	5.30	6.20	1.35	1.65	.....
1177		San Francisco, Cal.....	Nov., 1855...	Lt. R. S. Williamson...	do	11.75	4.60	5.80	1.36	1.80	Dr. J. S. Newberry.
1352		do	Jan., 1856....	Lt. W. P. Trowbridge....	do	12.00	5.50	6.60	1.62	1.70	.....
536	1849	San Pablo Bay, Cal....	do	do	do	8.75	5.00	.....	1.04	1.42	.....

PUTORIUS VISON.

Common Mink.

“*Mustela lutreola*, FORSTER, Philos. Trans. LXII, 371.”

“Sabine, in Franklin’s Narr. 1823, 652.”

Mustela vison, BRISSON, Quad. 1756, 246.

SCHREBER, Säugt. III, 1778, 463; tab. cxxviiβ

GMELIN, Syst. Nat. I, 1788, 94.

CUVIER, R. Anim. I, 1817.

HARLAN, Fauna Americana, 1825, 63.

MAXIM. Reise I, 1839, 213.

Mustela (Martes) vison, DESM. Mamm. I, 1820, 183.

GRIFF. Cuv. V, 1827, 124.

Mustela (Putorius) vison, RICH. F. B. A. I, 1829, 48.

Mustela (Lutreola) vison, WAGNER, Suppl. Schreb. II, 1841, 241.*

Lutra vison, SHAW, Gen. Zool. I, 1800, 448. (Vison of Buffon.)

Putorius vison, GAPPER, Zool. Jour. V, 1830, 202.

DEKAY, N. Y. Zool. I, 1842, 37; pl. xi, f. 1.

AUD. & BACH. N. A. Quad. I, 1849, 250; pl. xxxiii.

Mustela canadensis,¹ ERXLEBEN, Syst. Anim. I, 1777, 455.

Mustela canadensis, var. β *vison*, BODDERT, Elenchus Anim. I, 1784, 86, (from Buffon.)

Mustela viningus, BARTON, Am. Phil. Trans. VI, 1809, 70. (Mink of St. Louis; no description.)

Mustela minx, ORD, Guthrie’s Geog. 2d Am. ed. II, 1815, 291, 298.

Mustela lutreocephala, HARLAN, F. A. 1825, 63.

? *Mustela rufa*, HAM. SMITH, in Jard. Nat. Lib. Mamm. XIII, 1842, 189, (perhaps pine marten.)

Vison, BUFF. Hist. Anim. XIII, 1765, 308; pl. xliii. (This description, with those of Brisson and Pennant, under the same name, all taken from the same specimen.)

¹ See preceding remarks on the history of *Mustela pennantii*, page 151.

Vison weasel, PENNANT, Hist. Quad. 1781, No. 205.—In. Arctic Zool. I, 1784, 78.

Lesser otter, PENN. Hist. Quad. 1781, No. 228.

Mink, PENN. Arctic Zool. I, 1784, 87.

SP. CH.—Tail about half as long as the body. General color, rather dark brownish chestnut. Tail nearly black. End of chin white, but not the edge of the upper jaw.

The well known mink of the United States is so much like an otter in appearance as to merit the name of *lutreola*, equally well with its Old World representative. It is, however, a true weasel, although in many points quite different from the smaller and more slender ermines.

(No. 1154.)—The head of the mink is broad and depressed, quite abruptly truncated anteriorly, with the corners rounded. The naked muffle is a little broader than high above, about twice the width of the septum.

The whiskers are long and rigid, arranged in four horizontal series, with a fifth less distinct in the edge of the upper lip. There are several stiff long hairs behind the angles of the mouth, as well as under the chin, opposite the centre of the skull. The eye is small, the centre half way between the nose and the anterior border of the meatus. The ears are not so large as in the ermines, rather longer than high, entire, except the lower half of the posterior margin, which is split into two laminae; both surfaces are rather thickly coated with hair.

The feet are large and broad, the anterior quite as broad as the hinder, but not so long. On the fore foot the third toe is longest; the fourth but little shorter; then the second; the fifth is intermediate between the first and second. In the hind foot the third and fourth are nearly equal; the second and fifth also equal, but shorter; the first shortest. All the toes are webbed at their bases, this extending farthest along between the third and fourth.

The balls of all the toes are naked and not at all overgrown with hairs, making five on each foot. Behind these, under the metacarpus and metatarsus, are four others placed, respectively, at the bases of the digits; one of these, larger than the rest, situated at the line of junction of the third and fourth digits. On the fore foot is an additional pad near the outer edge, behind the outer metacarpal pad, separated from it by hairs. There are narrow valleys between the pads on the palms and soles, but no hairs, so that when stretched apart all appear as one naked space. To sum up, in a word, there are nine naked balls on the hind foot, and ten on the fore foot. The under surfaces of the feet are well furred around these pads, except as described. The tail is rather long and conical, tapering gently to the tip. Including the hairs, it is about equal to half the length of head and body. There is a soft close under fur, with longer, coarser, and very lustrous hairs intermixed. This is seen on the tail as well as the body.

This species is all over of a nearly uniform chestnut brown, not appreciably lighter beneath; the tail is considerably darker; the end of the chin is white, as also a spot between the fore legs.

There is a great difference in the size of different specimens of this animal, and the gradations between the extremes are so gentle in this respect, as well as in color, as to render it very difficult to establish more than one species. Thus among the skins before me are two of very large size—the one from near Vancouver's island, (1025,) the other from the upper Missouri, (1755,)—in which the entire pelage is a light yellowish brown, the feet of the same color, and the end of the tail only a little darker. The body appears to have been almost as stout as that of an otter.

Some specimens have a slight tinge of gray in the chestnut, others are redder than the first one described. In nearly all there is a white patch on the end of the chin, and others on the throat, belly, or between the legs. Occasionally, however, a specimen is met with in which

there are no white spots whatever. The tail is generally darker than the body; in most cases nearly black in its terminal portion.

In the very great variation in size of different specimens, I would not be much surprised if the upper Missouri should furnish a new species, characterized by its very large size, and including number 1025. I am unwilling, however, to give a new name to this, in my ignorance as to whether the eastern species of mink ever attains these dimensions. The difference in color of the two mentioned above is not sufficient to constitute a species, especially as there is a dark brown one (1751) equally large with the lighter colored, (1755,) and otherwise agreeing perfectly with it.

Specimens from the south have coarser and stiffer hair than more northern ones. The feet in summer generally are more naked than in winter.

I regret not having had the opportunity of comparing the American mink with its near relative, *P. lutreola* of Europe and Asia. Judging from the descriptions of authors, this species appears to be smaller, and to have the edges of the upper lip white, a feature which never occurs in the American animal. It is one of the rarest of European mammals, very different from our species, which is so well known to every farmer as the pest of his existence. Cases are not unfrequent where a mink in a single night has killed twenty or thirty chickens or other domestic fowls.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	Whence obtained.	Original number.	Nature of specimens.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Collected by—
675	1847	...	Carlisle, Pa?	S. F. Baird	...	Dry skin .....	.....	.....	.....	.....	.....	.....
805			St. Simon's island, Ga.....	G. Würdemann .....	.....	do .....	.....	.....	.....	.....	.....	.....
2303			Prairie Mer Rouge, La.	James Fairie .....	.....	do	19.00	8.75	11.00	.....	2.80	.....
162	1145	.....	do	do .....	.....	do	14.00	6.50	7.75	.....	2.40	.....
163	1146	.....	do	do .....	.....	do .....	.....	.....	.....	.....	.....	.....
1390			Bloomington, Ill.....	R. Kennicott .....	.....	do	17.00	6.00	7.50	.....	2.60	S. Army.....
? 2329			West Northfield, Ill	do .....	.....	Skin in alcohol .....	.....	.....	.....	.....	.....	.....
731		♀	do	do .....	.....	Dry skin	15.00	7.00	8.00	.....	2.40	.....
1154 ¹			Wisconsin.....	A. C. Barry.....	.....	Skin in alcohol	17.00	8.00	9.25	1.90	2.50	.....
1751			Cannon Ball river, Neb.....	Lt. G. K. Warren .....	.....	Dry skin	20.00	8.25	9.25	.....	2.80	Dr.F.V. Hayden.
? 1755			Fort Pierre, Neb.....	do .....	.....	do	19.50	8.00	9.00	.....	.....	do
? 1023			Disputed island, near Vancouver's island.	Dr. George Suckley ..	64	do	20.00	7.00	7.50	.....	3.00	George Gibbs ...
1423			Klamath Lake, Cal.	do .....	.....	do .....	.....	.....	.....	.....	.....	do
1176			Upper Klamath Lake, Cal.....	Lt. R. S. Williamson. ....	.....	do	17.50	6.00	7.00	.....	.....	Dr.J.S.Newberry.
.....			San Francisco.....	Lt. Trowbridge .....	.....	do .....	.....	.....	.....	.....	.....	.....
655			Fort Steilacoom, W. T.....	Dr. George Suckley ..	18	do	14.50	5.50	6.50	.....	.....	.....
2387			Cape Flattery, W. T	do	137	Hunter's skin .....	.....	.....	.....	.....	.....	.....
2388			do	do .....	.....	do .....	.....	.....	.....	.....	.....	.....
2389			do	do	146	do .....	.....	.....	.....	.....	.....	.....
2390			do	do .....	.....	do .....	.....	.....	.....	.....	.....	.....
2391			do	do .....	.....	do .....	.....	.....	.....	.....	.....	.....
2392			do	do	140	do .....	.....	.....	.....	.....	.....	.....
2393			do	do	138	do .....	.....	.....	.....	.....	.....	.....
2402			Fort Steilacoom, W. T	do .....	.....	Skin in alcohol .....	.....	.....	.....	.....	.....	.....

¹ From tip of nose to eye, 1.05; to ear, 2.15; to occiput, 3.00.

PUTORIUS NIGRESCENS, Aud. & Bach.

Little Black Mink.

Putorius nigrescens, AUD. & BACH. N. Am. Quad. III, 1853, 104; pl. cxxiv. (Not in first edition.)

SP. CH.—Smaller than the common mink. Color, chestnut brown, glossed with black. Tail almost entirely black. End of the chin white.

It is with very great hesitation that I admit this animal to the rank of a distinct species from the common mink; at least I have not yet been able to make such examinations and comparisons as satisfy me of the difference. It is true that in the northern States there is a mink of usually small size, and of a considerably darker color and softer fur than others found further south; whether these are more than climatic differences, yet remains to be proved. Specimens of very large size, from the upper Missouri and westward to the Pacific, are as dark as those in northern New York, although referrible rather to *P. vison*, on account of their dimensions.

It is this species or variety that furnishes the most valuable mink skins; those of best quality readily yielding from three to five dollars each to the hunter. In fact, there is, perhaps, no fur which approaches so near to that of the famed Russian sable as the northern black mink. In nothing is the change of value effected by the caprices of fashion more strikingly illustrated than in the case of this fur. Ten years ago, ten cents would have been considered a good price for the best skin to be found in a latitude such as that of Pennsylvania, and fifty cents for the more northern ones. Since then, the value has increased at least ten-fold, owing to the greater appreciation of the fur as an article of dress.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of hind foot.
1080	.....	Middleboro', Mass	Nov. 22, 1855	J. W. P. Jenks	Skin	15.00	5.50	6.50	.....
1407	2254	Essex county, N. Y	Winter	Dr. S. E. Hale .....	.....	13.00	5.50	6.50	1.80
1408	2255	do	do	do .....	.....	16.00	6.50	8.00	2.30
1028	2015	do	Sept., 1855.	S. F. Baird .....	.....	.....	.....	.....	.....
1653	.....	Garrettsville, Ohio .....	.....	S. M. Luther .....	.....	.....	.....	.....	.....
? 716	.....	Fort Leavenworth .....	.....	Lt. D. N. Couch .....	.....	.....	.....	.....	.....

PUTORIUS NIGRIPES, Aud. & Bach.

Black-footed Ferret.

Putorius nigripes, AUD. & BACH. N. Am. Quad. II, 1851, 297; pl. xcii.

SP. CH.—Size of the pine marten. Tail, with hairs, one-third the length of head and body. Forehead, feet, and end of tail, black. Body yellowish brown above, white beneath.

I have introduced the diagnosis of this remarkable species from Audubon and Bachman, not having had the opportunity of seeing a specimen. Indeed, the only one known is that figured and described in the *North American Quadrupeds* of the above mentioned authors, and collected by Mr. Alexander Culbertson, on the lower waters of the Platte.

The length to root of tail of this specimen is given at 19 inches; of the vertebræ of the tail at 4; and of the entire tail at 5½ inches.

It is a little remarkable that so conspicuous and well marked a species should have eluded the notice of all the recent explorers in the Platte region.

GULO, Storr.

Gulo, STORR, "Prod. Meth. Anim. 1780."

Teeth 38. Molars, five above and six below. Lower sectorial tooth without any internal tubercle. Soles densely hairy, with six small naked pads. Tail about as long as the head, very full and bushy. Body stout, bear-like.

The genus *Gulo*, in all essential features of dentition and general structure, is closely allied to the martens and weasels, though it differs so much in shape. In fact, the resemblance to a small bear is so striking, that it has by several authors been placed among the *Ursidae*. From this family, however, the densely pilose under surfaces of the feet, and its only partially plantigrade character, independently of the skull and teeth, at once distinguish it.

The dental formula of this genus is the same as in the typical martens, viz: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{1-1}{2-2} = \frac{18}{20} = 38$.

GULO LUSCUS.

Wolverine.

A. EUROPEAN.

Mustela gulo, LINN, Syst. Nat. 1766, 67.

Ursus gulo, SCHREBER, Säugt. III, 1778, 525; pl. cxliv.

Gulo borealis, NILSSON, Ill. fig. til Skand. Faun.

KEYSERLING & BLASIUS, Europ. Wirbelt. 1842, 66.

WAGNER, Suppl. Schreb. II, 1841, 246.

B. AMERICAN.

Ursus luscus, LINN. Syst. Nat. 10th ed. I, 1758, 47.—IB. 12th ed. I, 1766, 71.

ERXLEBEN, Syst. I, 1777, 167.

SCHREBER, Säugt. III, 1778, 539.

SHAW, Gen. Zool. I, 1800, 462; pl. cxv, (from Edwards.)

Gulo luscus, "SABINE, in Narr. Franklin's First Voyage, 650."

RICH. F. B. A. I, 1829, 41.

DEKAY, N. Y. Zool. I, 1842, 27; pl. xii. f. 2.

AUD. & BACH. N. A. Quad. I, 1849, 203; pl. xxvi.

Gulo arcticus, DESM. Mamm. I, 1820, 174. Var. A.

HARLAN, F. Am. 1825, 60.

Gulo wolverene, GRIFF. Cuv. V, 1827, 117.

Meles luscus, BODDAERT, Elenchus Anim. I, 1784, 80.

Wolverine, PENNANT, Hist. Quad. 1781, Nos. 176, 177.—IB. Arctic Zoology, I, 1784, 66. (Leverian Museum.)

CHURCH, Cabinet of Quadrupeds, II, 1805; plate.

SP. CH.—Dark brown. Tail, (except at base,) legs, and beneath, black. A lighter broad band on flanks, passing over the base of the tail and rump. A grizzled light patch along the temples.

The materials at my command are not such as to allow of a very satisfactory account of the American wolverine, as there is no skull and only a single skin.

The head is somewhat pointed, and in shape closely resembles that of a bear. The muffle is naked for about half an inch from the end of the snout, the line of separation from the hair being transverse. The septum is naked, and the naked space on the anterior portion of the muzzle extends to the edge of the upper lip, narrowing as it descends. The eyes are very small,

scarcely exceeding those of the domesticated rabbit. The ears, too, are very small, and nearly concealed in the fur, longer than high, and well coated on both sides with hair.

The feet are large and powerful. The claws are large, sharp, and much curved; those of the fore feet largest. The soles of the fore feet are densely covered with stiff bristly hairs, excepting on the balls of the toes. There is also a large naked patch beneath the carpus. The first front toe is placed considerably behind the rest, although its claw reaches nearly to the base of that adjacent to it. The fourth toe and claw are considerably longest; the third claw reaches about half way along the fourth; the fifth is a little less, the second is still less. The longest of the hind claws is the third; the fourth is a little shorter, then the second, fifth, and first. As far as discernible in the skin, the balls of the toes are naked, making five pads, and there is a sixth under the metatarsus. The tail measures from one-third to one-fourth the length of head and body; it is very thick and densely bushy, with very long hairs, which are shorter at the tip, thus imparting a subtruncate appearance.

The hair is nearly as full and long as that of the black bear, the long staple is coarser, and there is among its roots a good deal of rather coarse, wiry, crimped wool.

The most prominent color is a dark purplish brown; the tail, except at the base, the limbs, and under parts generally, nearly black. The flanks, commencing behind the axillæ and passing backwards over the base of the tail, are of a paler tint of chestnut brown, which gives rise, laterally and posteriorly, to a light border to the dark color of the back. There is a grizzled patch of mixed hoary and chestnut hairs passing from the central line of the forehead above the eyes along the temples and a little obliquely to the ears. There is a tuft of white hairs on each side of the neck, and another between the legs.

Dimensions of No. 45.

	Inches.
Length to root of tail -----	36
Tail to end of vertebræ -----	9
Tail to end of hairs -----	14
Longest hairs of the tail -----	7
Longest hairs of the body -----	4

The specimen described above is unusually large, considerably exceeding those mentioned by Audubon and Bachman and Richardson. It was brought to Fort Union from some of the posts towards the Rocky Mountains.

I have no European specimens before me for comparison, but the wolverine is now pretty generally considered to be identical with the glutton of Europe. First described by Linnæus as *Ursus gulo*, this specific name was lost when taken for a generic one. The name next in priority was the *Ursus luscus* of Linnæus, founded on a specimen brought from America. Should, therefore, it become expedient to separate the Old and New World species, the name of *Gulo luscus* will remain for the American, the European receiving that of *Gulo borealis* or *arcticus*.

The wolverine is confined, in North America, to the more boreal regions. Occasionally met with in northern New York, it is more abundant further north. It is found at times in the Black Hills of the Missouri, but it is most numerous in the Rocky Mountains and towards the polar circle. The most southern locality known in the west is the basin of the Great Salt Lake.

This animal is known throughout the United States as wolverine, sometimes as carcajou. In Europe it bears the name of glutton, and in both countries almost fabulous accounts are prevalent of its ferocity and cunning. In the American fur countries they are very annoying to trappers from their propensity to follow their lines of marten traps, and devour either the bait or the animals captured. They also do much mischief by tearing up the caches of provisions or peltry, and either destroying or devouring the contents.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
45	Northwest of Fort Union, Nebraska.	A. Culbertson and E. T. Denig	Dried skin

SUB-FAMILY LUTRINAE.

Mustelidae with the posterior upper tubercular molar large, quadrate. Number of molars the same in each jaw. Feet short, palmated.

The typical otters bear a strong resemblance to the minks, the last mentioned group of the weasels, although the skull and teeth approximate much more closely to the *Melinae*. The body is elongated, the feet short, the toes palmated. The species are generally of large size, and all more or less aquatic.

The group of the otters embraces three principal genera—*Lutra*, *Pterura*, and *Enhydris*. The former again has been subdivided into those with claws, well developed, and those with very rudimentary ones, or none at all. *Pterura* is a South American genus, having the tail dilated laterally on either side. Of *Lutra*, North America probably possesses two species; of *Enhydris*, one.

LUTRA, Linn.

Lutra, LINN. "Syst. Nat. I, 1735."

GEN. CH.—Body elongated, feet short, palmated; digits distinct, the central longer than the exterior ones; tail moderate, depressed, rounded at the sides.

The skull of the otters, in general, resembles that of the *Martinae*, but is more depressed, and more contracted behind the orbital processes. The top of the skull is nearly straight, and almost parallel with the margin of the lower jaw.

The dental formula is: incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{3-3}$; molars, $\frac{1-1}{2-2} = \frac{18}{18} = 36$.

The genus is very widely distributed, being found in all quarters of the globe. The species resemble each other, and are separated with great difficulty, owing to their plain colors; they differ in the extent and character of the naked muffle, the palmation and hairiness of the feet, details of the skull, &c. America has one strongly marked species, with several varieties, according to authors; whether the *Lutra californica*, of Gray, from the Pacific slope, be really distinct from that of the Atlantic, is yet to be finally ascertained by the examination of more specimens than are now accessible to the student.

LUTRA CANADENSIS, Sab.

American Otter.

Lutra canadensis, JOS. SABINE, Zool. App. Frankl. Jour., 1823, 653.

F. CUV. Dict. des Sc. Nat. XXVII, 1823, 242.

GRIFFITHS' CUV. V, 1827, 130.

RICH. F. B. Am. I, 1829, 57.

FISCHER, Syn. 1829, 225.

PR. MAXIM. Reise in das innere Nord Am. I, 1839, 211.

DEKAY, N. Y. Zool. I, 1842, 39; pl. iii, f. 1; pl. xxxiii, f. 1, 2, 3. (Skull.)

AUD. & BACH. N. A. Quad. II, 1851, 2; pl. li.

GIEBEL, Säugt. 1855, 789.

Lutra lataxina, F. CUV. Dict. des Sc. Nat. XXVII, 1823, 242.—IB. Suppl. Buff. I, Mammif. 1831, 203.

FISCHER, Synopsis, 1829.

Lutra brasiliensis, HARLAN, F. Am. 1825, 72.

GODMAN, Am. N. H. I, 1831, 222.

Lutra hudsonica, F. CUV. Suppl. Buffon, I, Mammif. 1831, 194.

Lutra vulgaris, var. *canadensis*, WAGNER, Suppl. Schreb. II, 1841, 256.

"*Lataxina mollis*, GRAY".¹

Lutra canadensis, var. *Lataxina mollis*, GRAY, Aud. & Bach. N. A. Quad. III, 1853, 97; pl. cxxii.

SP. CH.—Length about $4\frac{1}{2}$ feet. Muzzle longer than wide, sending down a naked point along the median line of the upper lip anteriorly. Under surfaces of the feet so covered with hair towards the circumference as completely to isolate the naked pads of the tips. A hairy strip extending forward from beneath the carpus on the palm. Color above, liver brown, barely lighter beneath; inferior surface and sides of head and neck dirty whitish.

General form musteline. Head broad and blunt, neck long. Body depressed, low; legs short. Tail long, tapering, much depressed, about three-fifths as long as the head and body.

The naked muzzle is quite large, its posterior outline running up into the forehead, so as to be as long, or rather longer than broad; this outline is decidedly $\wedge$ -shaped, the acute angle behind; the lines are not quite straight, but slightly sigmoid. The anterior outline of the

¹ I have not been able to find this quotation.

muzzle is gently semi-circular, and anteriorly sends down a narrow point, dividing the hair of the lip over about one-sixth of its length. The nostrils are large and open, their posterior line extending not beyond the centre of the naked muffle.

The whiskers are arranged in numerous rows, the precise number not being determinable in the dry skins examined by me. There is a clump of three or four stiff bristles over the eye, a rather larger number behind the eye, several behind the angle of the mouth, and some scattered under the chin. The eyes are very small, the orbits not exceeding half an inch in length. The ear is small, tapering, but rounded at the tip, rather higher than wide, (a little more than half an inch.) The eye is considerably in advance of the median point between the ear and tip of muzzle.

The feet are broad and webbed to a point opposite the root of the claws, the greater portion of the terminal naked pads being free. In the fore feet the palms or under surfaces are entirely hairy, excepting the central basal portion, which is naked and papillose; there is, however, a small peninsula of hair extending forward in this naked space from below the carpal joint. The pads at the ends of the toes are naked, but they are entirely cut off from the naked central portion by the hairy area. The fingers, when spread out, have their tips nearly in the circumference of a semi-circle described from the centre of the palm as a centre, the central one rather longer. When laid side by side, the third finger is longest, the fourth and second successively a little shorter; the first shorter than the fifth.

The characteristics of the hind feet are much like those of the fore feet, the inside surfaces or soles are hairy over the membranes, the central basal portion being naked. The naked pads are entirely isolated from the central bare spots by the hair on the membrane. The extreme posterior portion of the heel is hairy. In the naked surface posteriorly are three small tubercles. The tips of the claws, when the foot is outspread, are nearly in the circumference of a circle. When the toes are close together the fourth claw projects furthest, the third is but little shorter; the second reaches to the base of the third; that of the fifth falls short of the base of the fourth; that of the first reaches the penultimate articulation of the second toe.

The general color of the outer fur in a Washington specimen examined is a highly lustrous dark liver brown, but little lighter on the belly. The under fur here is, however, decidedly lighter, which imparts this general character to the pelage. On the sides of the head below the eyes, (including the lips,) and on the chin, extending along the throat to between the legs, the color is a dirty whitish, tinged with brown. The under fur generally is of a yellowish white, like raw silk, at the base, and light liver brown at the tip, the latter color predominating on the back, the former on the belly and sides. The legs and upper surfaces of the tail are rather darker than elsewhere.

A skin of an otter from Fort Wayne agrees essentially with that described above, except in having rather less hair on the under surfaces of the membrane of the fore feet.

A small otter (1877) from Fort Kearney is quite similar in the character of the feet. There appears, however, to be a greater space between the naked muffle and the edge of the lip; the width being rather greater than the length. The lower outline of the muffle is straight; the upper quite acute, as described.

There has been considerable uncertainty in reference to the number of species of otters in the interior of the United States, and some naturalists have even insisted that there was but one, and that identical with the European *Lutra vulgaris*. Of the incorrectness of this latter view, a comparison of specimens will at once convince the observer. Whether we have two species

east of the Rocky Mountains I am unprepared to say, the only specimens I have had an opportunity of examining are all referrible to the *Lutra canadensis* of authors; what is the precise value of the *L. lataxina* of F. Cuvier, from Carolina, or of the *L. mollis* of Gray, from Hudson's Bay, I cannot now decide.

The character of *Lutra lataxina* rests mainly, according to Cuvier, upon the straightness or even concavity of the superior outline of the skull, from occiput to the end of the nasal bones. I have noticed this character in a very old skull from Carlisle; younger specimens have this profile rather more convex.

The correctness of the reference by some authors of a North American otter to the *Lutra brasiliensis* is readily disproved by a comparison of specimens. The most striking difference is seen in the muzzle, which in the latter species is entirely hairy, except around the nostrils, instead of being naked, as in *L. canadensis*.

The differences between the American and European otters are very appreciable, both in the external form and the skull.

In *Lutra vulgaris* the skull is less massive, more elongated, and narrower. The muzzle and interorbital spaces are much narrower. The width of the muzzle behind the incisors is about equal to its length, measured from the anterior edge of the orbit to the anterior end of the intermaxillaries, while in *L. canadensis* the width of the muzzle is considerably greater than its length.

The most striking peculiarity of external form in the European species is the small size of the naked muffle compared with the American. This, in a nearly grown skin, is only about four-tenths of an inch wide, and about as long, instead of the eight-tenths of the other. The under surfaces of the feet are entirely naked, instead of having the pads separated from the toes by hair. The hair is composed almost entirely of under fur, the long hairs much more scattered than in the other. The color has in it much more of chestnut brown, like the southern mink or muskrat, and is not appreciably lighter beneath. This may, however, be a condition of age or season.

The otter of the Pacific slope of North America differs in some tangible points from that of the east, and has been described as *Lutra californicus* by Dr. J. E. Gray.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimens.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Collected by—
A	.....	.....	Washington, D. C. ....	.....	Belonging to the National Institute.	.....	Mounted .....	.....	.....	.....	.....	.....
B	.....	.....	Fort Wayne, Ark. ....	.....	do .....	.....	do .....	.....	31.00	.....	18.00	.....
1877	2275	♀	Fort Kearney, Neb.	July 5, 1856	Lt. F. T. Bryan	53	Skin	5.00	24.00	15.00	15½.	W. S. Wood.
80	.....	○	Ogdensburg, N. Y.	Winter ?	W. E. Guest .....	.....	Skin, 3 months.	5.00	24.00	14½.	15.00	.....
2356	3143	○	St. Simon's island, Ga. ....	.....	Dr. S. W. Wilson .....	.....	Skin .....	.....	.....	.....	.....	.....
3142	.....	.....	do .....	.....	do .....	.....	Skeleton .....	.....	.....	.....	.....	.....

LUTRA CALIFORNICA, Gray.

California Otter.

Lutra californica, J. E. GRAY, Charlesworth's Mag. Nat. Hist. I, 1837, 580.

SP. CH.—Length about four and a half feet. Naked muzzle wider than long; no naked point sent down from its anterior edge. Under surfaces of all the feet but little hairy; the naked terminal pads not isolated from the other bare portions by hair, except in the central digits of the fore foot. The naked portion of the palm not invaded by hair from the carpal region.

Color above, liver brown, the long hairs with lighter tips; not appreciably lighter on the belly. Sides and under surface of head and the throat, dirty white.

In general form, as far as can be ascertained from the tanned skin, the otter collected by Dr. Newberry resembles that found in the eastern States. The muzzle is large and runs posteriorly into the forehead as an obtuse angle, with the apex slightly rounded; anteriorly the outline is sub semi-circular, and there is no acute naked point sent down along the median line. The width of the muzzle slightly exceeds the length. The nostrils are slightly valvular, so as to be capable of being closed by the impending projection of the side of the muzzle; they extend posteriorly opposite the central point of the naked muffle. The whiskers are in numerous rows, and there are tufts of similar stiff bristles over and behind the eye, behind the angle of the mouth, and under the chin. The ears are very small, pointed, and higher than broad.

The tail is long, tapering, and depressed. It is about three-fifths as long as head and body together. The legs are short, the feet rather large and well palmated. In the hands the web extends as far as the bulbs of the fingers. The greater portion of the inferior surface or the palm is free from hair; some is, however, discernible between the outer fingers (first and fifth) towards the exterior of the web, especially on that portion between adjoining fingers. The pads or balls at the ends of the fingers are all naked, and the entire under surface of the first and fifth fingers being bare, the pads of these fingers are connected with the naked palm by a continuous naked space, instead of being isolated by hair, as in the three central ones. The fourth finger is longest, the third little shorter; next the fifth; the second and then the first are considerably less. The claws are large and stout, a little shorter than those on the hind feet.

The hind feet are rather larger than the fore, but the proportions of the fingers are almost precisely the same. The membrane between the toes is also of nearly equal extent. The posterior third of the sole (from heel) is covered with hair, extending forwards into the naked portion in an acute angle. The anterior two-thirds is entirely naked, except over that portion of the web which extends between the toes. The terminal balls are entirely naked, and are connected by a naked isthmus extending under the central line of the toes with the naked sole. This isthmus covers most of the under surface of the first and fifth toes, but is narrower in the others. There is a stiff fringe of bristly hairs along the exterior of the foot.

The fur of this animal is of two kinds: one long and scattered, stiff and lustrous; the other very close, soft, dense, and silky, and slightly crimped. The predominant color is a dark chestnut, or rather light liver brown, not appreciably paler on the belly. The long hairs are decidedly lighter at their tips, assuming more of the chestnut tinge. The sides of the head and throat below the level of the eyes and ears, the upper lip, the under parts of the head and throat, generally, are of a dirty white, purest on the side of head and edge of upper lip. The legs and upper surface of the tail are rather darker than elsewhere.

There is apparently a preponderance of the light tips to the long hairs along the middle of the back and on the sides of the tail.

The concealed under fur is liver brown at the tip; that on the belly and sides being yellowish white at the base, the amount and clearness of the white decreasing to the median line of the back.

A comparison of this specimen with a very fine *L. canadensis*, killed in the Potomac river, near Washington, presents the following differences:

The naked muzzle is decidedly shorter antero-posteriorly, the width remaining the same. Length of the naked portion is less than its width, instead of being greater, as in the *L. canadensis*. The angle of the posterior outline is consequently less acute and is shorter, not running so far back on the forehead. The septum of the nostrils is narrower, and there is no naked point running down from its middle line and partly bisecting the middle of the upper lip, as in *L. canadensis*.

There is much less hair on the under surfaces of the feet. The peninsula of hair extending forward over the naked portion of the sole in *L. canadensis* is wanting entirely, and there is but little hair on the web between the fingers. The first, fourth, and fifth fingers are entirely naked under their middle line, instead of having the balls isolated by hair from the naked palm. A nearly similar condition prevails in the hind feet, except that there is no hair on the middle line of the inferior surface of any of the toes.

How far the characters thus adduced are sufficient to establish differences in species can only be determined by a comparison of more specimens. All the eastern skins of otters I have seen agree pretty well with the above description of *L. canadensis*, the hair on the under surface of the feet being distinctly appreciable when the digits are approximated, which is not the case in the California specimen. As a species has been instituted by Gray, I shall adopt it, whatever hesitation I might feel at introducing a new name based on a single specimen.

A comparison of the skull of the California otter with that of eastern specimens exhibits very close affinities, both being distinguished from the European *L. vulgaris* by common characteristics of great development of post orbital process of frontal bone, broad interorbital space, very broad and short muzzle, &c.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Locality.	When collected.	Whence obtained.	Nature of specim'n	Measurements.		Collected by—
						To root of tail.	Tail.	
1191	2029	Cascade Mts., O. T., lat. 44°, 160 miles south of the Columbia.	Sept., 1855	Lt. R. S. Williamson.	Skin---	53.00	19.00	Dr. J. S. Newberry.

ENHYDRA, Fleming.

"*Enhydra*, FLEMING, Philos. Zool. II, 187."

"*Enydris*, LICHT. Darstellung, &c.

SP. CH.—Fore feet, fin-like in shape; anteriorly four-lobed; the lobe next to the outer longest, with two claws above; hind toes becoming shorter from the fifth to the first.

The sea otter, the sole representative of the genus as far as known, is an exceedingly remarkable animal, with perhaps more resemblance to a seal than to the common otters. The head is short and very broad; the nose obtuse, with a naked muffle, and with three rows of stiff horny bristles. The digits of the fore feet are very short and firmly bound up in a thickened membrane, which on the palmar surface is naked and granular. The hand is divided into four lobes, representing the digits, excepting the third and fourth, which are bound together and bear two claws above. The hind feet have the outer toes the longest, the rest descending from the fifth to first; the under surface hairy, except under the balls of the toes. The hind feet are directed much further backwards than in the common otters, in this respect resembling the seals, except that in the latter the hind feet are crescentic in shape, owing to the middle toes being shorter than the lateral.

The skull and teeth of the sea otter differ very appreciably from those of the true otters, and well substantiate the generic separation of the two. The first small premolar of the upper jaw on either side is wanting, making the total number two less, or thirty-four in all.

ENHYDRA MARINA.

Sea Otter.

"*Lutra marina*, STELLER, Nov. Comm. Petrop. II, 1751, 367; tab. xvi."

ERXLEBEN, Syst. 1777, 445.

SCHREBER, Säugt. III, 1778, 465; pl. cxxviii.

DESMAREST, Mam. I, 1820, 189.

HARLAN, F. A. 1825, 72.

GODMAN, Am. N. H. I, 1831, 228.

WAGNER, in Wieg. Archiv, 1836, II, 281.

"*Enhydra marina*, FLEMING, Phil. Zool. II, 1822, 187."

GRIFF. Cuv. V, 1827, 132.

MARTIN, Pr. Zool. Soc. IV, 1836, 59. (Osteology.)

AUD. & BACH N. A. Quad. III, 1853, 170; pl. cxxxvii.

Enydris marina, LICHT. Darst. Säugt. 1827, 34; tab. xlix, l.

ERMAN, Reise um die Welt; tab. xi, xii.

"WAGNER, Gelehrte Anzeige, I, 555."

WAGNER, Suppl. Schreb. II, 1841, 274.

Latax marina, LESSON, Nouv. Tabl. R. A. 1842, 71.

Mustela lutris, LINN. Syst. Nat. I, 1766, 66.

Gm. Syst. Nat. I, 1788, 92.

Phoca lutris, PALLAS, Zoog. Rosso-As. I, 1831, 100.

Lutra lutris, F. Cuv. Suppl. Buff. I, Mammif. 1831, 204.

Enydris stelleri, ("Less. Man.") FISCHER, Syn. 1829, 229.

Enydris gracilis, FISCHER, Syn. 1829, 229.

Sea otter, PENNANT, Hist. Quad. 1781, No. 230.—IB. Arctic Zool. I.

1784, 88. (Leverian Museum.)

A single specimen of the sea otter was obtained at Steilacoom by Dr. Suckley. It was, however, too imperfect to admit of any detailed description, the legs and tail being entirely wanting. The size considerably exceeds that of the land otters of North America. The naked muffle is larger and runs backwards, parting the hair on top of the snout, so as apparently to be longer than broad. The ears are even smaller than in the common otters.

The long hairs of the sea otter are much more scattered and are longer than in the land otters. The under and inner fur is also longer and softer, though the character is much the same. The long hairs are mostly black, with the terminal portion dull brownish yellow, this predominating on the sides. The under fur is light brownish gray at the base, becoming purplish brown to the tip. The entire head is of a light brownish yellow.

The sea otter is an inhabitant of the Pacific coast in both hemispheres—on the American side extending as far south, at least, as Monterey. Formerly very abundant, they are now becoming more and more rare, owing to the war of extermination carried on against them on account of the value of their fur. This is not so highly prized now as formerly, but is sufficiently sought after to make the pursuit of the fur, still found on the coasts of California and Oregon, remunerative. According to Meare, the young have the fine fur completely overlaid by white hairs, which, with increasing age, fall out, leaving a short blackish fur. When fully adult this is jet black and very fine and lustrous, usually with a few white hairs interspersed. In extreme age the fur changes to a dark brown, and is then of less value. The skins of the males are more valued than those of the females, on account of the velvet-like texture of the fur.

SUB-FAMILY MELINAE.

Upper posterior tubercular molar very large; quadrate or triangular. Upper sectorial tooth with a large internal central tubercle. Check teeth in both jaws unequal in number. Feet usually with naked soles; fore claws very long, compressed, and fossorial.

The present group embraces but a limited number of genera, each, with one exception, having very few species. They are distributed through all parts of the world, although America possesses by far the largest number in its numerous species of skunks.

The genera recognized at the present time as belonging here are—*Meles*, *Taxidea*, *Mydaus*, *Arctonyx*, *Mephitis*, and *Helictis*. *Meles* has one European representative, the common badger; *Mydaus*, *Arctonyx*, and *Helictis* belong to southern Asia; while *Taxidea* and *Mephitis*, with its subdivisions, are peculiar to America—the former genus embracing the badger of the west, the latter the skunks.

MEPHITIS, Cuvier.

Mephitis, CUVIER, "Leçons d'Anat. I, 1800."

Body elongated; nose pointed; feet fossorial, the anterior claws longest, soles usually naked; tail long, bushy; upper posterior molar very large and nearly square. Color black, with white markings.

In the above diagnosis are indicated enough of the peculiarities of this genus to separate it from its allies; there are, however, many other points to be referred to in anything like a full statement of its distinguishing features. That by which the skunks are best known, namely, the ineffably offensive odor of the secretion of the anal glands is shared, though in a less degree, by nearly all the *Mustelidae*.

The body of the skunks is considerably more slender than in the badgers, their nearest allies, and the long and densely haired tail, with the prevalent black color, varied by white stripes or spots on the upper parts, in addition, readily distinguish them. The caudal hairs are very thick, weak, and brittle, with somewhat the texture of antelope or deer hair; their attachment to the skin is very slight, especially those at the terminal portion. The tip of the tail is sometimes occupied by a rather slender tuft of hairs, inserted in the midst of the more bushy termination, and appearing to have but little connexion with it.

The head is quite small in proportion to the body, pointed, with a naked, acute, and projecting nose; the eyes are small and piercing, the ears short and rounded. The feet are short, each with five closely united toes, with long claws; the anterior longest, sharp, compressed, and not much curved; eminently fossorial. The palms are naked; the soles are naked, except about on the posterior third from the heel, which is hairy; in one species, (*M. mesomelas*,) the entire sole is, however, hairy.

These animals usually walk on the greater part of the soles, with the back much curved, the tail erect. They are strictly nocturnal; the food consists chiefly of animal substances.

The offensive liquid of the skunks, the fœtid smell of which has passed into a proverb, is secreted by two glands which empty directly into the rectum, and are enveloped in a thick muscular membrane, the contraction of which causes the ejection of the fluid to a considerable distance. This, when first discharged, is said to be quite phosphorescent at night. A very slight degree of irritation is sufficient to cause the emission of the liquid, which, it is said, may, however, be restrained by holding the animal up by the tail.

The dental formula of most species of *Mephitis* is similar to that of *Putorius*, viz: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{3-3}{3-3}$, molars $\frac{1-1}{2-2} = \frac{16}{18} = 34$. In the sub-genus *Thiosmus*, however, one upper anterior premolar is wanting, reducing the number to 32. The genus may at once be readily distinguished from the weasels by the large size of the posterior upper molar, which is nearly square, quadrituberculate, as broad as long, and as long or longer than the sectorial tooth anterior to it. The internal tubercle of this tooth is very greatly developed, so that the crown is triangular. The lower sectorial molar (first true molar) has almost lost this carnivorous character, owing to the development of tubercles, three on the inner border, two on the outer, and one behind.

There appear to be two very well marked divisions, as established by Lichtenstein, in the following diagnoses:

Thiosmus.—Upper incisors linear, the outer stronger and longer than the intermediate ones;

the lower equal, with a longitudinal groove in the posterior face. Upper molars, three on either side; lower, five, the anterior sometimes deciduous. The naked muzzle depressed, produced, with the nostrils entirely inferior. Soles broad, naked. Tail moderate.

Mephitis.—Upper incisors nearly equal, the outer but little the stouter. Upper molars, four on each side; lower, five, the anterior never deciduous. Snout prominent, not depressed; nostrils lateral. Soles rather narrow, partially or entirely hairy.

All the North American species belong to the last division, excepting the *Mephitis mesoleuca*, which is a *Thiosmus*.¹

The species of these two divisions of *Mephitis* are confined to America, and extend through both halves of the continent; several of them are peculiar to Mexico. Of *Thiosmus*, two species are Mexican, one of them extending into the United States; all the rest are South American, where the restricted *Mephitis* does not occur.

MEPHITIS (THIOSMUS) MESOLEUCA.

White-Backed Skunk.

Mephitis mesoleuca, LICHTENSTEIN, Darstell. neuer Säugt. 1827, 34; tab. xlv. f. 2.—IB. Abh. K. Akad. Berl. for 1836, 1838, 271; tab. i, f. 1. (Skull.)

WAGNER, Suppl. Schreb. II, 1841, 192.—IB. in plates of Schreber's Säugt. IV, cxxi, A.

SCHINZ. Syn. Mam. I, 1844, 319.

AUD. & BACH. N. A. Quad. II, 1851, 18; pl. liii.

Mephitis nasuta, BENN. Pr. Zool. Soc. I, March, 1833, 39.

FRASER, Zoologia Typica, No. 4. Plate.

Thiosmus nasuta, LESS. Nouv. Tableau R. Anim. 1842, 66.

SP. CH.—A broad, uninterrupted band of white, beginning abruptly at the nape as a transverse straight line, and occupying the entire back to the tail, which also is entirely white.

A single specimen of this species was collected by Captain Pope, in Western Texas. It is, however, in very poor condition, and does not furnish materials for an accurate description, owing to the loss of the hind feet, &c.

The muzzle of this animal is elongated and much depressed; naked for nearly an inch from the end above, and half as much below—the hair extending a little further than this on the sides. The nostrils are entirely inferior, not visible from above, or laterally.

The upper lateral incisors are rather larger and longer than the central. The lower incisors with a furrow on their posterior side. According to Lichtenstein, there are but three upper molars; in the skull (1886) before me, however, a fourth is visible, next to the canines, but it is very small and rudimentary.

The body of this species, as in nearly all the others, is black, with the exception of the white dorsal stripe. This begins on the middle of the crown, in a transverse straight line of an inch in width, widens rapidly, so as on the middle of the back to occupy fully half the entire circumference, contracts again to the base of the tail, where it is about two or three inches wide, and then passes into the tail, which is entirely white throughout. There is no black enclosed in the white of the back, this color being continuous throughout.

This species is similar, in some respects, to *Mephitis leuconota* of Lichtenstein; this is, how-

¹ J. E. Gray, in Charlesworth's Magazine of Natural History, I, 1837, 581, establishes two genera—*Conepatus* and *Marputius*—the latter of which, to some extent, covers the ground of *Thiosmus*, and anticipates it in point of date; though objectionable in some respects, a strict regard for the law of priority may cause it to be retained.

ever, much larger (almost equal in size to a fox); the tail is longer, and instead of being entirely white, is of this color only on the top and the terminal half; the stripe, too, begins as an acute angle on the vertex, instead of being decidedly truncate. Length, 17 inches; tail about 12.

This species was first described by Lichtenstein from a specimen caught near Chico, in Mexico, and subsequently (?) a new name was given by Bennett to one from Lower California.

Not much information is on record as to the geographical distribution of this species. I have seen but one specimen—that collected by Captain Pope on the Staked Plains. It is said by Audubon and Bachman to be quite common in Texas. There is no indication of its occurrence in Upper California.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
790	1886	Western Texas	Captain J. Pope, U. S. A.	Skin

MEPHITIS VARIANS, Gray.

Texas Skunk.

Mephitis varians, J. E. GRAY, Charlesworth's Mag. N. H. I, Oct. 1837, 581.

Mephitis macroura, AUD. & BACH. N. A. Quad. III, 1853, 11; pl. cii. (Not of Lichtenstein.)

SP. CH.—Tail full, bushy, but attenuated and pointed towards the end, where the hairs are very long. Vertebrae alone as long as the body. Color black; a narrow white frontal line. A white nuchal patch, broad and truncated anteriorly, and extending between the ears; then passing backwards, narrowing a little to between the shoulders, when it bifurcates narrowly, the branches passing along the sides to the hind legs; another narrow white stripe on either side commences within the termination of these and runs out on the posterior half of the tail. The tail black, the hairs white on the basal half; there is a patch on the middle of the tail, however, where the hairs are white to the end.

Length to root of tail, 15 inches. Vertebrae, 15. Terminal hairs, 3½.

For a more detailed account of this skunk I would refer to the Report of the Zoology of the United States and Mexican Boundary Survey; no specimens were collected by any of the Pacific Railroad surveying parties.

This species was first described by Gray, as quoted above, and erroneously referred by Audubon and Bachman to the *M. macroura* of Lichtenstein, which is a very different species. It is found throughout Texas, and is said to be very abundant. Its northern and southern range are not ascertained; and it is not known as an inhabitant of California.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Age & sex.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.
709	-----	♀	Monterey, Mex.	-----	Lt. D. N. Couch	218	Skin
237 ¹	-----	○	Matamoras, Mex.	-----	do	-----	Kitten
238 ¹	-----	○	do	-----	do	-----	do
127 ²	1113	-----	Mier, Texas	April, 1852	Major W. H. Emory ..	-----	Skin
233 ²	1192	-----	Eagle Pass, Texas	Sept. 1, 1833	do	-----	do

¹ Collected by Dr. Berlandier.

² Collected by Arthur Schott.

MEPHITIS OCCIDENTALIS, Baird.

California Skunk.

? *Mephitis mesomelas*, ST. HILAIRE, Voy. de la Venus, Zoologie, I, 1855, 133; plate.

SP. CH.—Size of a cat. Tail vertebrae two-thirds the length of head and body. Bony palate with small narrow emargination in the middle of its posterior edge. Color black, with a white nuchal patch, bifurcating behind and reaching to the tail, which is entirely black.

Judging from the skull this animal must have been of very large size, considerably exceeding the average of North American specimens. The nose is large and broad, the hairs come on the upper side to within about a quarter of an inch of the end, the nostrils, however, are terminal and entirely lateral. The feet are very large and broad, considerably exceeding corresponding specimens of the common eastern species. The soles are hairy on their posterior third. The tail appears to be about equal in length to the head and body.

The color, as in most skunks, is black; there is a narrow line of white on the forehead between the eyes; a nuchal patch commences back of the ears and extends to the shoulders, then bifurcates into two narrow lines, which extend along the side of the back, diverging most in its middle portion, and approximating towards the base of the tail, opposite which it abruptly ceases—the two an inch or more apart. The exterior of the tail is entirely black; the bases of all the hairs are white, this color reaching nearer to the end of the hairs along the median portion. A few scattered hairs, entirely white, are seen here and there, but they are not at all prominent.

This species bears a close resemblance to the *Mephitis varians*, but is considerably stouter and thicker, with stronger and broader feet. The tail is much shorter, entirely black externally, instead of being invaded in its middle portion by white. The skulls are quite different. *M. chinga* has a much broader nuchal patch, a less continuous lateral stripe, a shorter tail, with a white tip, not black; it is also without the notch in the bony palate.

This appears to be the animal that is figured in the Voyage de la Venus as the *Mephitis mesomelas* of Lichtenstein. This cannot be the name, however, as the *mesomelas* is characterized among all the skunks by the densely pilose soles, a feature wanting in the present specimen. The description in the Voyage de la Venus makes no mention of the character of the soles.

The skull of the California skunk, three of which are before me, has a peculiarity I have seen in no others. The posterior margin of the palate is concave in its outline, with a decided emargination in the middle line, reaching nearly to the posterior edge of the last molar. In all others this outline is either transverse, or the palate extends further backwards in its middle line than on the sides, making a cordate outline.

Measurements.

Current number.	Locality.	Nose to tail.	Tail to end of—		Length of—		Skull.	
			Verteb.	Hairs.	Fore feet, naked portion.	Hind feet.	Length.	Width.
1944	Petaluma, Cal -----	19. 25	12. 25	16. 00	2. 20	3. 00	3. 36	2. 06

List of specimens.

Catalogue numbers.	Corresponding No of skull.	Locality.	Whence obtained.	Nature of specimen.
-----	2031	Santa Clara, Cal.-----	Dr. J. G. Cooper-----	Skull-----
-----	2434	Petaluma, Cal.-----	E. Samuels-----	do-----
1944	2617	do-----	do-----	Skin-----
-----	-----	Fort Steilacoom, W. T.-----	Dr. G. Suckley-----	do-----

MEPHITIS MEPHITICA.

Skunk.

Viverra mephitica, SHAW, Museum Leverianum, 1792, 172; plate.—IB. Gen. Zool. I, 1800, 390.

Mephitis chinga, TIEDEMANN, Zool. I, 1808, 362. (In part.)

LICHT. Darst. Säugt. 1827-34; plate xlv, f. 1.—IB. Ueber *Mephitis*, Abh. Akad. Wiss. Berl. for 1836, (1838,) 280.

MAXIM. Reise Nord. Amer. I, 1839, 250.

WAGNER, Suppl. Schreb. II, 1841, 198.

AUD. & BACH. N. A. Quad. I, 1849, 317; pl. xlii.

GIEBEL, Säugt. 1855, 766.

Mustela (Mephitis) americana, DESM. Mamm. I, 1820, 186.

Mephitis americana, JOS. SABINE, Zool. App. Franklin's Journey, 1823, 653.

HARLAN, Fauna Americana, 1825, 70.

DOUGHTY's Cab. N. H. II, 1832, 193; pl. xvii.

DEKAY, N. Y. Zool. I, 1842, 29; pl. xii, f. 1.

Mephitis americana var. *hudsonica*, RICH. F. B. A. I, 1829, 55.

Chincha americana, LESSON, Nouv. Tabl. R. A. 1842, 67.

Mephitis chinche, (Tied.) FISCHER, Syn. 1829, 160, (in part.)

Le chinche, ST. HIL. & CUV. Hist. des Mammif. II, 1819; plate. (Louisiana)

SP. CH.—Soles naked, except on the posterior third. Tail vertebræ half the length of head and body, with hairs considerably less. Color black; a narrow frontal line; a broad triangular nuchal patch, continuous, with a narrow line on either side of the back, nearly to the tail, and a tuft at the end of the tail, white. The dorsal stripes sometimes broader; sometimes wanting, as also the nuchal patch.

This species varies considerably in its markings, though individuals from the same locality are usually quite similar. In a series of five specimens from Middleboro', Massachusetts, the prevailing color is, of course, black. There is a narrow white line on the forehead. Just back of the ears, on the nape, commences a broad triangular patch of yellowish white, the base anteriorly a transverse straight line of about two inches in width, and the length about one-half greater. On the upper part of the neck, confluent with this patch, commence two narrow lines of white, one on each side, which run parallel to each other for a few inches, then diverge rapidly and cease abruptly a little beyond the middle of the body. The tail is black, with a narrow tuft of white in the extreme tip; all the caudal hairs are white at the base. There is also a small tuft of white hairs on each side of the tail near the base. One specimen lacks the terminal white tuft, but this appears to have been lost or not grown out. In those possessing it the white hairs project many inches beyond the end of the black ones, and are of a different texture.

A skin from Washington city is black, with the frontal narrow white line, and a crescentic white patch on each side of the head, behind the ear; no nuchal patch whatever; there is a

distinct terminal tuft of white. Another skin from Louisiana is similar, but lacks the terminal tuft. Wherever there is a white tuft in specimens, it is constituted by hairs about six inches long springing from the end of the vertebræ, the longest black hairs in the same region being only half this length.

I have never seen a skunk having so much white on the back as figured by Lichtenstein, though this may be a common variety. The Middleboro' specimens mentioned above, and still more the western ones, 206 and 1864, agree pretty well in markings with the *Mephitis mesomelas* of Lichtenstein, but are totally distinct in lacking the hairy sole.

Measurements.

Current number.	Locality.	Nose to tail.	Tail to end of—		Hind foot.	Skull.	
			Verteb.	Hairs.		Length.	Width.
1069	Middleboro', Mass.....	16. 50	8. 00	13. 00	2. 00	-----	-----
1068	-----do-----	19. 00	9. 25	14. 25	2. 50	2. 90	1. 81

A specimen collected by Dr. Suckley, on the Bois des Sioux, Minnesota, is of very large size, exceeding in bulk quite a large cat. The head, as usual, is small in proportion to the body. The ears are distinct and quite conspicuous; less so, however, than in the weasels. They are thinly coated, on both sides, with short hairs. The feet are large. The front claws are considerably larger than the hinder ones; the central three about equal, but the third projecting furthest on account of the longer toe; the fifth smaller, reaching to the middle of the fourth; the first smallest, extending to the base of the second. The entire palms and soles are naked throughout, the skin roughened and horny.

The tail is bushy and full but rather short, the vertebræ scarcely half the head and body. The hairs on the tail are long, full, and bristly, measuring in places seven inches in length. On the body there is a basal coat of coarse woolly fur with longer hairs interspersed.

The body generally is of a rather lustrous brownish black. There is a narrow median white line on the top of the head extending to the occiput. On the nape begins a rather broad stripe of white which bifurcates at an acute angle over the shoulders, and passing along the upper part of the sides extends a short distance on the sides of the tail where it disappears; between the white stripes the black of back and tail are continuous. The rest of the tail appears black, but many of the hairs are seen to be grayish for most of their length from the base.

This specimen is much larger than the average of common skunks, measuring twenty-one inches to the root of the tail, the vertebræ of which are nine; its skull is much larger than that of any eastern specimen I have seen. The fur is thinner and rather softer, though this may be the effect of season. The ears are larger. Although the skulls of the skunks vary little, yet there are here certain characters distinguishing the western specimens from the eastern. Thus with the same breadth between the zygomata the cranium is narrower and tapers more acutely behind. The last two upper molars are considerably larger in proportion, and the penultimate one has the outer side of its cross section longer. A similar difference of size is discernible in the lower jaw. I have had no opportunity to examine skins illustrating the western form except the one referred to, and one recently received, 1864, agreeing with it in color.

The common American skunk possesses a very wide range, and is especially abundant

throughout the Northern, Middle, and Central States. Should the upper Missouri specimens be the same, its distribution will be still wider. The specimen from Louisiana, besides the peculiarity of color, differs from the northern ones before me in a narrower and more tapering skull anteriorly, and may indicate a different species in the southwest.

From the very great similarity of the different species of American skunks, it becomes a matter of much difficulty to settle their synonymy. The common species of eastern North America, by many of the earlier authors, has been mixed up and entirely confounded with those from South America of an entirely distinct genus, (*Thiassmus*.) For this reason it becomes impossible to quote the *Viverra mephitis* of Erxleben, Schreber, Gmelin, and other authors.

For a long time the name of *Mephitis chinga*, as imposed by Tiedemann, was supposed to be the first name restricted to our common skunk. That of *Viverra mephitica*, given several years before, however, seems to be entitled to replace it, the generic and specific names being sufficiently distinct, and the alliteration not more objectionable than in many other fully accepted species, as *Mus musculus*, &c.

List of specimens.

Catalog'g number.	Correspond'g No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n	Collected by—
1068	2047	Middleboro', Mass.	Dec. 17, '55	J. W. P. Jenks....	-----	Skin ---	-----
1069	-----	-----do-----	Dec. 5, 1855	-----do-----	-----	do ---	-----
1070	-----	-----do-----	Dec. 3, 1855	-----do-----	-----	do ---	-----
1071	-----	-----do-----	Nov. 20, '55	-----do-----	-----	do ---	-----
1426	2292	-----do-----	Spring, 1856	-----do-----	-----	do ---	-----
81	-----	Washington, D. C.	-----	-----	-----	do ---	-----
292	-----	Calcasieu, La.	-----	G. Würdemann....	-----	-----	-----
? 206	1177	Bois de Sioux, Neb ---	1853	Gov. I. I. Stevens..	3	do ---	Dr. Geo. Suckley.
? 1864	-----	Heart river, Neb -----	Sept. 21, '56	Lt. G. K. Warren--	-----	do ---	Dr. F. V. Hayden.

MEPHITIS BICOLOR.

Little Striped Skunk.

Mephitis bicolor, J. E. GRAY, Charlesworth's Mag. N. H. I, 1837, 581.

Mephitis zorilla, LICHTENSTEIN, Ueber Mephitis, Abh. Akad. Wiss. Berlin, for 1836, (1838,) 281; tab. ii, f. 2. (Not of Darstellungen neuer Säugt.; tab. xlviii, f. 2, which represents the African animal.)

WAGNER, Suppl. Schreber II, 1841, 199; tab. cxxiii.

AUD. & BACH. N. Am. Quad. III, 1854, 276, (not figured.)

? ? *Mephitis interrupta*, RAFINESQUE, Annals of Nature, 3, 4.

FISCHER, Synopsis, 1829, 162.

? *Mephitis interrupta*, LICHTENSTEIN, Ueber Mephitis, Abh. Akad. Wiss. Berlin, for 1836, (1838,) 283; tab. ii, f. 1.

"*Le zorille*, BUFFON, Hist. Nat. XIII, 1765, 302; tab. xli." (Fide LICHTENSTEIN.)

SP. CH.—Smallest of North American species. Tail vertebræ, less than half the body; with the hairs not much more than half. Black, with broad white patch on forehead, and crescent before each ear; four parallel dorsal stripes interrupted and broken behind; a shorter stripe on side of belly, running into a posterior transverse crescent, which are white. Tail black throughout, to base of hairs, except a pure white pencil at the end.

This diminutive species, the smallest of the American skunks, is eminently conspicuous for the great beauty of its markings. In length it does not exceed an ermine weasel, though of pro-

portionally stouter body. The nose is rather long and acute, the nostrils truly lateral, and only visible from the side. The feet are much as in the common *M. chinga*. The tail vertebrae are about half the length of the head and body; the entire tail rather less than these.

The body is black, with a subquadrate white patch one-half longer than broad on the crown. A crescent encircles the anterior base of the ear. There are four parallel longitudinal stripes on the body; two narrow ones starting at the occiput, separated by an interval of half an inch, and two others, one on either side, broader and confluent with the lower edge of the crescent of the face, extending along the middle of the sides; another stripe on each side begins on the side of the belly, behind the axillae. These six stripes are continuous to beyond the middle of the body; they are then interrupted, to reappear in a series of four spots or blotches, these opposite each other, sometimes confluent so as to form transverse bands of white on the flanks, especially the anterior ones, into which the lowest lateral stripes run. The hairs of the tail are entirely black, except the terminal tuft of much longer hairs, which are, throughout, white, and appear to occupy the terminal half of the tail.

A skull of, probably, this species, from California, indicates a larger specimen than the above. I give the dimensions of this, in connexion with those of two smaller ones from Texas, probably of the same species, and of about the size of that in the skin just described.

Measurements.

Current number.	Locality.	Length.		Width across zygomata.		Width across base of skull.	
		Inches.	100ths.	Inches.	100ths.	Inches.	100ths.
2118	California	2.40	100	1.49	.63	1.30	.54
1621	Texas.....	1.96	100	1.25	.64	1.05	.54
1622	---do	2.01	100	-----	-----	-----	.50

The question as to the proper name of this species is somewhat difficult to settle. Two species are described in Lichtenstein's Monograph, in the Berlin Transactions, quoted above: one, the reproduction of the *M. interrupta*, of Rafinesque, based on a specimen in the Berlin Museum, said to have been brought by Koch from the upper Missouri; the other, the *M. zorilla*, (n. s.) referred to the *zorille* of Buffon, Hist. Nat. XIII, 1765, tab. xli, brought from New California by Deppe. I can scarcely realize any difference between the two beyond the smaller size and a white tuft in the tail of the latter, which, however, is probably caducous, as in the common species. The Texas animal might readily have been found in Louisiana, as quoted by Rafinesque. I do not feel sure, however, that the description of Rafinesque, like most of his species, is not a mere figment of his imagination, especially in the discrepancy between it and the subject of Lichtenstein's article.

The *Mephitis bicolor* of Gray, though rather larger than Lichtenstein's specimen, clearly covers the same ground with *M. zorilla*, and if identical, will take precedence in point of date. Lichtenstein's name, at any rate, would be inadmissible as previously affixed by Fischer to a South American species. The *Mephitis zorilla* of Lichtenstein's Darstellungen belongs to the African species.

For the present, then, or until more material is collected from California and Texas, it will be well to hold Rafinesque's name in abeyance and to adopt that of Gray. Should the smaller

species, or that corresponding to the *M. zorilla*, be distinct, it will probably be necessary to impose a new name upon it, that of Lichtenstein being clearly inadmissible.

Measurements.

Current number.	Locality.	Nose to—		Tail to end of—		Length of hind foot.
		Occip.	Tail.	Verteb.	Hairs.	
1188	Santa Clara, Cal.-----	2. 50	11. 00	4. 00	7. 50	1. 60

Several skulls of a very small species of *Mephitis* were collected by Mr. Clark at Indianola ; but no skins saved. These, though perfectly adult, are scarcely larger than those of the common ermine weasel, *P. noveboracensis*, measuring but two inches in length. The skull is more pointed anteriorly than in other species of North American skunks ; the line of intersection of tangents to the upper canines and molars falling little more than half the length of the palate in advance of the incisors, instead of nearly the whole length of the palate, as in *M. chinga*. The last upper molar is narrower, longitudinally, than in this last mentioned species.

List of specimens.

Catalogue number.	Corresponding No. of skull	Locality.	Whence obtained.	Nature of specimen.	Collected by—
1188	-----	Santa Clara, Cal.-----	Dr. J. G. Cooper -----	Skin.-----	-----
-----	2118	-----do-----	-----do-----	Skull -----	-----
-----	1621	Indianola, Texas.-----	Col. J. D. Graham-----	-----do-----	J. H. Clark-----
-----	1622	-----do-----	-----do-----	-----do-----	-----do-----

MEPHITIS MESOMELAS, Licht.

Mephitis mesomelas, LICHT. Darst. Säugt. 1827-34; tab. lv, f. 2.—Ib. Abh. Akad. Wiss. Berlin, for 1836, (1838,) 277.

SP. CH.—Soles entirely covered with hair beneath. A narrow white line from the nose to the vertex, and a nuchal stripe, truncated anteriorly, divided behind into two, which extend along the sides of the back and of the tail.

The very remarkable character exhibited by this species in the densely hairy soles, with the short fore claws, separates it at once from all others. Lichtenstein, who describes it first, from specimens in the museums of Leyden and Berlin, quotes it as occurring in Louisiana and on the Missouri river, though no American naturalist or collector seems to know anything about it. The length of body is given at nineteen inches, of the tail at nine. I have never met with the species, and introduce it here for the purpose of calling attention to it.

Some other species of skunks which may possibly occur within the limits of the United States are the following :

MEPHITIS (THIOSMUS) LEUCONOTA.

Mephitis leuconota, LICHTENSTEIN, Darstellung Säugt. 1827-34; tab. xlv, f. 1.

Id. Abh. K. Akad. Berl. for 1836, (1838,) 271.

SP. CH.—A median stripe, acuminate at the vertex, widening in the middle of the back, contracted behind and continued over the upper surface of the tail, which is nearly but not entirely white. Length to root of tail, 24 inches; of tail, 12 inches; width of stripe in the middle of the back, 3 inches.

From the river Alvarado, Mexico. Specimen in Berlin museum.

MEPHITIS MACROURA.

Mephitis macroura, LICHT. Darst. Säugt. 1827—1834; tab. xlv.

Id. Abh. Ak. Wiss. Berl. for 1836, 1838, 277.

WAGNER, Suppl. Schreb. II, 1841, 196.

(Not of AUD. & BACH.)

Mephitis mexicana, J. E. GRAY, Charlesworth's Mag. I, 1837, 581.

SP. CH.—Tail vertebræ nearly as long as the body. A broad nuchal patch, truncate anteriorly, and continued behind into a simple, broad, undivided dorsal and caudal stripe. A separate longitudinal stripe on the middle of each side. Length of body, 14 inches; of tail vertebræ, 13 inches; its terminal hairs, 5 inches.

Found in the temperate portions of Mexico. Specimens in Berlin Museum.

MEPHITIS VITTATA.

Mephitis vittata, LICHTENSTEIN, Darst. Säugt. 1827, 34; tab. xlvii.

Id. Abh. Ak. Wiss. Berl. for 1836, (1838,) 278.

WAGNER, Suppl. Schreb. II, 1841.

SP. CH.—A narrow line from nose to vertex; one or two streaks on each side, along the occiput; a solitary stripe on each side from the parotid region to the base of the tail. Body, 13 inches; tail vertebræ, 11 inches; terminal hairs, 4 inches.

Found in Oaxaca, Mexico.

The pol-cat of Catesby, (Car. II, 1731, 62; pl. lxii,) black, with five narrow white lines, has not been identified.

The *Mephitis myotis*, of Fischer, (Syn. 1829, 164,) is based on a description in Dupratz' Louisiana, II, 97, fig.? Body black in the male, black margined with white in the female; ears and feet mouse-like. Size that of a young cat. The animal cannot be identified.

TAXIDEA, Waterhouse.

Taxidea, WATERHOUSE, Pr. Zool. Soc. Lond. VI, 1838, 154.—*Id.* Trans. Zool. Soc. Lond. II, 1841, 343.

Body stout, robust, depressed. Tail very short. Fore claws much largest; very fossorial. Posterior upper molar very large, sub-triangular. Skull wedge-shaped.

Incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{3-3}{3-3}$, (including the upper sectorial,) molars $\frac{1-1}{2-2}$, (including lower sectorial,) = 32. In young specimens there is an additional premolar, (first,) which soon disappears; this will add 1—1 premolar to the lower jaw, making 34 in all.

The third premolar with two tubercles; the sectorial of the upper jaw and the molar behind it very large, triangular and nearly equal. Body stout, depressed; tail short; ears short, pointed; muffle hairy above. Fore claws much larger than hinder; very fossorial.

The genus *Taxidea*, is peculiar to North America, and at present embraces two species—one inhabiting Mexico, the other the western United States and British America. It was first established by Waterhouse on skulls taken from skins brought from Mexico or California, and erroneously supposed to be the same with those from British America. His descriptions and figure, therefore, will be understood as having reference, probably, to *T. berlandieri* rather than to *T. americana*.

This genus is so strikingly different from *Meles* as to render it a matter of astonishment that the typical species were ever combined. The discovery of a second species in Mexico, agreeing in all essential generic features with the boreal species, is an additional confirmation of the propriety of separating the two genera.

The most striking peculiarity of *Taxidea* consists in the great expanse of the occipital region, the width of the occiput being equal to that of the skull, measured between the outer surfaces of the zygomatic arches. Thus the general shape is that of a depressed wedge, widest behind and truncated anteriorly, instead of being very much widest across the zygomatic arches, as in *Meles*. The skull of *Meles*, indeed, resembles in general shape much more that of *Procyon* than *Taxidea*, its occipital region being low, and the outline rising thence, instead of being highest very near the occiput. The occipital crests are well developed in *Taxidea*, the sagittal very moderate.

The auditory bullæ are very large and convex. The processes of the glenoid cavity are not so well developed as in *Meles*, though occasionally sufficiently developed to lock the condyles of the lower jaw. The coronoid process has its apex pointed instead of rounded or truncated; its posterior margin is formed by two lines, the lower rising nearly perpendicularly a little in advance of the condyle, the other rather longer than the first, making a very obtuse angle with it.

The differences in the character of the teeth are equally striking, though their number is the same. The penultimate, or sectorial upper molar is very large and triangular; fully equal in size to the last molar, instead of being much smaller; it has likewise a large tubercle on the inner lobe, scarcely observable in *Meles*. The last molar is also triangular, (nearly right-angled,) somewhat resembling half the quadrilateral tooth of *Meles*.

In the lower jaw the last premolar is larger than in *Meles*, and has two tubercles. The penultimate molar is smaller and not dilated behind; the portion of its crown which is applied against the upper sectorial molar is larger than that in contact with the last upper molar, instead of being smaller, as in *Meles*.

TAXIDEA AMERICANA.

American Badger.

Ursus taxus, SCHREBER, Säugt. III, 1778, 520, fig. 142, B. (From Buffon.)

Meles taxus, var. β *americanus*, BODDAERT, Elenchus Anim. I, 1784, 136.

Meles americanus, ("BODD.") ZIMMERMANN, Pennant's Arktische Zoologie I, 1787, 74.

Ursus labradorius, GM. Syst. Nat. I, 1788, 102.

KERR's Linnæus, 1792, 187.

SHAW, Gen. Zool. Mamm. I, 1800, 469; pl. cvi.

Meles labradoria, MEYER, Zool. Archv. II, 1796, 45.

J. SABINE, App. Narr. Franklin's 1st Journey, 1823, 649.

HARLAN, F. A. 1825, 57.

GRIFF. Cuv. V, 1827, 116.

RICH. F. B. A. I, 1829, 37; pl. ii.

FISCHER, Synopsis, 1829, 151.

WAGNER, Suppl. Schreber, II, 1829, 182.

AUD. & BACH. N. A. Quad. I, 1849, 360; pl. xlvii.

Taxus labradoricus, SAY, Longs' Exped. I, 1823, 261, 369.

? *Taxidea labradoria*, WATERHOUSE, Pr. Zool. Soc. VI, 1838, 154, (probably *T. Berlandieri*).—*Id.* Trans. Zool. Soc. II, V, 1841, 343, pl.

HAM. SMITH, Int. Mamm. Jard. Nat. Lib. XIII, 1842, 210.

Meles jeffersonii, HARLAN, F. A. 1825, 309, (based on description of Lewis and Clark.)

American badger, PENNANT, Syn. Quad. 1771, 202.—*Id.* Hist. Quad. 1781, No. 298, β .—*Id.* Arctic Zoology, I, 1784, 71. (Leverian Museum.)

Badger of Columbia river, LEWIS & CLARK's Travels, II, 1814, 177.

Le Carcajou, F. Cuv. Suppl. Buffon, I, Mammif. 1831, 268.

SP. CH.—Head grizzled gray, black on the end of snout, and along the eyes. A median white line from near the nose to the nape. Legs and a crescentic patch before the ears black. Cheeks and under parts generally white.

The body is very stoutly built and depressed; the tail short, about one fourth the length of body, well clothed with long stiff hairs. The hair in summer is coarse throughout, without any wool; it is of considerable length on the back and sides (three or four inches.) The muzzle is naked at the extreme end, or around the nostril, and on the septum; its top and sides are, however, hairy, as is the space between the border of the nostrils and the edge of the upper lip. The ears are short, erect, pointed, and covered with coarse hairs on both sides. The fore claws are very much longer than the hinder; in their relative development and shape not dissimilar to those of *Geomys*. The third fore claw is longest, then the second, and then the fourth. These are not very unequal, but the first and fifth do not extend to more than half the length of the claws adjacent to them. Both palms and soles are hairy on their posterior half.

A fine specimen of the American badger, collected in Wisconsin, probably in winter, is in general color not strikingly dissimilar to the ground hog, (*Arctomys monax*.) The long straight coarse hair is well filled in with a coarse wool, which with the basal portion of the long hairs are of a dull pale brownish yellow, (at the extreme roots having a grayish tinge.) The terminal half of the long hairs is lustrous brownish black, except at the tip, which is yellowish hoary. Owing to the long loose texture of the hairs all the colors of yellowish, brown, and hoary are distinctly observable, the back having the strongest impression of brownish, the sides of the hoary. The under parts are pretty uniformly pale brownish yellow, nearly white on the middle line of the belly and under the head. The legs and feet are quite uniform, dark brownish black. The top of the head, including the whole muzzle, is dark brown, mixed with hoary, as this color fuses in that of the back; this band narrows from the muzzle to the eyes, covering

the whole space between the eyes and encircling the orbits; behind these it widens so as to be almost tangent to the ears. A well defined line of whitish commences about half an inch posterior to the naked muzzle, (and of about this width,) and passes along the central line of the top of the head, tapering gradually until it comes to an acute termination on the upper part of the nape. The hairs in this stripe are uniformly colored to their roots. The whole side of the head, including the margins and exterior of the ears, are also dull whitish, the inner or posterior face of the ear, a transversely elongated patch in front of the ear, and the sides of the snout, as described, brownish black. There is a small double spot of the same color on the central line of the throat, midway between the ante-auricular patches, from which spring a few black bristles; there are also a few bristles in the ante-auricular patches, as well as springing from the sides of the muzzle. The tail is of a reddish yellow, tipped with brown.

A summer specimen from the Upper Missouri, changing its hair, is paler above, and the old long hairs are brownish yellow with a dark band near the base, the subterminal band reddish brown, the tip hoary. The general color above is more yellowish than as described. A young one from the Upper Missouri is similar, but more hoary above.

As a general rule summer specimens have coarser and stiffer fur, owing to the greater predominance of the long hairs over the basal ones. The colors also are more yellow, or less hoary.

A very fine specimen of badger, (1320,) was collected by Lieut. G. K. Warren, on the Upper Missouri, in much better condition than those described. The markings on the face are much cleaner, the white purer, and the entire back is strongly hoary, or whitish gray, without any tinge of yellow.

General dimensions.

	217.	
	Inches.	Lines.
Nose to root of tail.....	22	-----
Tail from root to end of vertebræ.....	5	-----
Tail from root to end of hairs.....	6	-----
Arm, longest claw.....	1	7
Leg, longest claw.....		8
Skull, length.....	5. 12	-----
width.....	3. 23	-----

Although the European and American badgers at one time were supposed to be the same, yet the differences between them are not merely specific but generic. The most striking distinctions are to be seen in the hairs of the upper part of the muzzle, the smaller ears, the stouter feet and claws, the more conical or wedge-shaped head, &c., of the American badger. The European species has three white lines on the upper part of the head, one central, the others lateral, with two black ones between them, which include the ears and eyes, instead of the dark muzzle, single light line on the top of the head, and the light cheeks and ears, with dark blotch before and behind the latter. The chin and throat of the European species are black, in the American, white. Other differences are pointed out by Sabine.

The following is the result of a direct comparison of the European with the American badger since the body of this article was written :

The differences between the European and American badgers are so strongly marked as scarcely to require a comparison. Thus, in the former, the top and sides of the head may be described as white, the end of the muzzle completely encircled by this color ; a little more than half way between the end of the snout and the eye commences a strip of black, truncate anteriorly, and sending down a small branch towards the canine ; this strip widens gradually, including the eye and ear, and is lost on the shoulders. The black of the legs extends over the throat to near the end of the chin. There are thus on the top and sides of the head five stripes, a median, and two lateral white ones, and two intermediate of black, in addition to the black beneath the head ; and anterior to the ear all the stripes are of the same width.

In the American badger the top of the head is grizzled, with a narrow white median stripe ; the end of the muzzle (top and sides) is black. The cheeks are white, with a crescentic black patch anterior to the ear. The whole under part of head and throat are white.

There are other important differences of structure. Thus the naked muffle is much larger than in the American, and the hairs on the top of the nose do not come within a quarter of an inch of the extremity, instead of reaching to the very end.

The American badger is widely distributed throughout the United States, extending from Wisconsin, Illinois, and Iowa, to the Pacific ocean. It ranges far to the north, though no positive indication is on hand of its occurrence south of about latitude 35°, below which it appears to be replaced by the other species.¹

Although most authors have made the Mexican badger the same with that of the Missouri plains, yet the distinctions are quite decided, as will be seen in the article on *Taxidea berlandieri*.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.	Collected by—
.....	2078	.....	Quasquiten, Iowa.....	.....	E. C. Bedwell .....	.....	Skull .....	.....	.....
713	.....	.....	Rock county, Wis .....	.....	O. Dinsmore.....	.....	Dry skin ..	.....	.....
1791	.....	.....	Fort Pierre, Neb	1856	Lt. G. K. Warren...	.....	do .....	.....	.....
1320	.....	♂	Upper Missouri	1855	do .....	.....	do .....	.....	.....
1849	.....	.....	Cannon Ball river, Neb.	Oct., 1856	do .....	.....	do .....	.....	Dr. F. V. Hayden...
207	1178	.....	Upper Missouri .....	.....	Gov. I. I. Stevens ..	.....	do .....	.....	Dr. Geo. Suckley...
908	1179	○	do .....	.....	do .....	.....	do .....	.....	do
775	1880	.....	do .....	.....	do .....	.....	In alcohol.	.....	do
1873	2571	♂	Pole creek, Platte river..	Aug. 1, 1856	Lt. F. T. Bryan	185	do	6. 20½ 5. 6½	W. S. Wood.....
1874	2572	♂	Republican Fork.....	Sept. 28, 1856	do	364	do	7½ 29. 4½ 6½	do
1195	.....	.....	Klamath Lake, Cal.....	.....	Lt. R. S. Williamson.	.....	do .....	.....	Dr. J. S. Newberry.

¹ This species has usually borne the name of *labradoria*, as imposed by Gmelin, in 1788. Boddaert, however, in 1784, named it *Meles taxus*, var. *americanus*, and in 1787, Zimmermann, in his German translation of Pennant's Arctic Zoology, called it *Meles americanus*. This name, therefore, takes priority of date over *labradoria*.

TAXIDEA BERLANDIERI?

Mexican Badger.

Meles labradoria, BENNETT, Pr. Zool. Soc. Lond. 1833, 42.? *Taxidea labradoria*, WATERHOUSE, Pr. Zool. Soc. Lond. 1838, 154.

SP. CH.—Similar to the common American badger, but with the light line of the top of the head continued, with intervals, to near the root of the tail.

A skin brought by Captain Pope from the Llano Estacado differs from all North American ones I have seen in having the white stripe of the top of the head continued backward to the shoulders, then interrupted for two or three inches, then reappearing in the middle of the back and traceable to near the rump. The hair on the back and the belly appears to have just grown out, as it consists almost entirely of stiff hairs less than an inch long. The hairs on the rump and the sides of the body are as long as usual. The size is rather less than that of the average of Missouri badgers.

This appears to be the Californian variety of badger referred to by Bennett as gray above, with a continuous vertebral stripe. In the Report of the Mexican Boundary Survey I have described a species as *Taxidea berlandieri*, from skulls in the Berlandier collection, and manuscript descriptions and figures of this same naturalist. The ground color of this species is rather reddish than gray, but I am unprepared to say whether they are the same or not. For the description of the skulls of the Matamoras species, and a full description from the Berlandier manuscripts, I would refer to the above mentioned report.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
1710	Llano Estacado, Texas.....	Captain J. Pope, U. S. A.....	Skin.

FAMILY.
URSIDAE.

FAM. CH.—Toes distinctly separated, five on each foot; walk plantigrade; coecum wanting. The sectorial teeth and the molars behind them tuberculated.

The family of the bears is characterized by the plantigrade walk, usually naked soles, except in *Ailurus*, (if this properly belongs to the family.) The teeth are the same in number with the *Canidae*, although their more carnivorous character is shown by the tuberculated molars. The sectorial or carnassial teeth of the *Canidae* and *Felidae*, with their cutting and compressed crowns, are here replaced by a broad tooth, the crown studded with tubercles.

There are two well marked groups, or sub-families of some authors—the one containing the true bears, the other the smaller, long-tailed species. They may be distinguished into *Ursinae*, or bears proper, of large size, clumsy form, very short tail; and *Sub-ursinae*, the species of small bears, with long tail and moderate size. To the former belongs *Ursus*; to the latter, *Procyon*, *Nasua*, *Cercoleptes*, &c.

PROCYON, Storr.

Procyon, "STORR, Prod. Meth. Anim. 1780."

GEN. CH.—Body stout; tail moderately long, not prehensile. Muzzle somewhat pointed.

The genus *Procyon* belongs, with *Nasua*, *Cercoleptes*, &c., to the section of *Ursidae*, called *Sub-ursus* by Blainville, and distinguished from the true bears by the smaller size, longer tail, more pointed muzzle, less number of teeth, &c. Among these *Procyon* is the only one found as yet within the limits of the United States, although it is probable that *Nasua*, as well as *Cercoleptes*, extends pretty far north through Mexico.

The shape of the Raccoon is not dissimilar to that of the badger, although it stands higher on the legs. Its head is broad behind, but tapers rapidly to a point. The ears are short and erect. The feet are all five-toed; the soles naked. In walking, the entire sole is not applied to the ground as it is when the animal is standing.

The dental formula in *Procyon*, as well as in *Nasua*, is: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{2-2}{2-2} = 40$; or one upper true molar on each side less than in *Ursus*.

The head of the animals of this genus is broad and depressed, the muzzle pointed to the truncate tip. The muffle is naked and quite large, projecting a little forward on the upper outline, but without the great development of *Nasua*. The naked surface above is broader than long, and the sub-horizontal nostrils, which, viewed laterally, represent the arc of a circle with the convexity downwards, extend behind to the posterior border of the naked muffle. The outline of the upper lip is continuous anteriorly, (not at all split;) the distance from the edge to the muffle is about equal to the height of the muffle anteriorly, and this space is covered with hair. In *Nasua* the nostrils are seen more on the front of the muffle and reach behind only halfway along its sides; the upper surface of the muffle is twice as long as broad, and extends forwards as a cartilaginous snout.

The whiskers of *Procyon* are in four principal horizontal series, of five or six bristles in each; there is also a tuft over the eye, one behind the angle of the jaw, and one under the middle of the chin. In one specimen of *Nasua* these bristles appear almost wanting.

The ears are moderately large, sub-ovate, and rounded above. They are covered with hair, except around the meatus. The length above the notch in *P. lotor*, and in the species generally, is about equal to the distance from the end of the nose to the eye.

The tail vertebrae are about half the length of the head and body, varying somewhat with the species. The tail itself is well covered with hair, and marked alternately with black and whitish rings.

The feet are all five-toed, and have naked soles from the wrist and heel, the skin of which is highly papillose, and evidently possesses a high degree of tactile sensibility. There are no distinct warts, or raised pads, although narrow deep creases or furrows which traverse the under surface in various directions correspond to similar ones in the cats and weasels. The claws are about equal in all the feet, considerably curved, not retractile, and moderately sharp. The thumb of the fore foot in *P. lotor* is shortest, the tip of the claw extending as far as the end of the outer digit; the third finger is longest, the fourth but little shorter; the claw of the second reaches to the end of the third digit. On the hind foot, in the same species, the inner toe is much shortest; the third and fourth nearly equal and longest; the second and fifth nearly

equal, and their claws reaching to the base of the claws of the third and fourth. There is no indication of any webbing between the toes, which are cleft nearly to the metacarpus and metatarsus.

The feet of *Nasua* exhibit considerable differences from those of *Procyon lotor*, as just described. The claws are considerably larger and stouter. The digits, too, are more united, the skin extending as far as the penultimate joint; the free portion of the toes, consequently, of much less extent. In the alcoholic specimen there is also a curious elongate papillose condition of the skin immediately under the heel, not observed in *Procyon*.

At present there appear to be two pretty well marked species of raccoon in North America—the *Procyon lotor* and *P. hernandezii*. As the characters of these depend somewhat on different proportions of certain parts of the body in each, I present tables of measurements of skins and skulls which may serve to illustrate their peculiar features.

Measurements.

Current number.	Locality.	Head.	Head and body.	Tail to end of vertebrae.	Tail with hairs.	Ear above notch.	Hind foot.	Fore foot.	Nature of specimen.	Remarks.
SKINS.— <i>Procyon lotor</i> .										
-----	National Institute, D. C., A.---	5	23	8½	10	2.0	4	-----	Mounted..	6 rings, 5 distinct..
-----	do.....do.....B.---	5	22½	7	8½	2.0	3 ⁹ / ₁₀	-----	do.....	do.....
-----	do.....do.....C.---	6	28	9	11	2.0	3 ⁸ / ₁₀	-----	Skin.....	5 distinct.....
1069	Middleborough, Me.-----	5½	19	9½	11	1.9	3 ⁶ / ₁₀	-----	-----	do.....
<i>Procyon hernandezii</i> .										
672	Bodega, Cal.-----	5½	24	9½	10½	2.0	4	-----	-----	6 distinct.....
1196	San Francisco, Cal.-----	-----	29	10½	12	-----	-----	-----	-----	5 distinct.....
272	Steilacoom, W. T.-----	5	27	11	12½	2.0	4½	-----	-----	do.....
1197	Fort Jones.-----	-----	27	12	13	-----	-----	-----	-----	-----
1052	San Elizario, Texas.-----	5	21	8½	9½	-----	-----	-----	-----	-----
1053	Devil's river.-----	5	19	7	8½	1.9	4.1	-----	-----	-----
1051	Espia.-----	-----	27	10	12	2.0	4½	3.2	-----	6 distinct.....

Measurements.

Current number.	Locality.	Total length.	Distance between ends of intermaxillaries and canyles.	Width between zygomata.	Height above base of cranium.	Least width of muzzle behind the canines.
SKULLS.— <i>Procyon lotor</i> .						
666	Carlisle, Pa.	4. 40	4. 27	-----	1. 40	1. 00
1068	Detroit	4. 36	4. 30	-----	1. 40	. 90
575	Carlisle, Pa.	4. 30	4. 20	2. 90	1. 40	. 90
898	New York	4. 50	4. 33	2. 94	1. 45	. 97
1659	Beesley's Point, N. J.	4. 43	4. 30	2. 90	1. 40	1. 04
766	Carlisle, Pa.	4. 43	4. 39	2. 80	1. 37	. 98
603	-----do	4. 36	4. 25	2. 67	1. 35	. 97
770	-----do	4. 20	4. 06	2. 55	1. 35	. 87
809	-----do	4. 16	4. 00	2. 45	1. 30	. 95
2202	St. Simon's island, Ga.	4. 78	4. 60	3. 00	1. 50	1. 10
<i>Procyon hernandezii</i> .						
~~2018~~ ~~1081~~	Espia, Mexico	4. 40	4. 30	-----	1. 50	. 96
~~2110~~ ~~1082~~	San Elizario, Texas	4. 34	4. 15	2. 50	1. 40	. 96
1388	Matamoras	3. 97	3. 80	2. 68	1. 35	. 93
1386	-----do	4. 70	4. 50	2. 80	1. 50	1. 05
1387	-----do	4. 80	4. 67	3. 17	1. 50	1. 08

PROCYON LOTOR.

Raccoon.

Ursus cauda elongata, "LINN. Syst. Nat. 1735, 35."

Et Amerikanskt Diur, LINN. Kongl. Vetenskaps Akad. Handl. 1747, 277; tab. ix.

Ursus lotor, LINN. Syst. Nat. (ed 10th,) I, 1758, 48.—*Id.* (ed 12th,) I, 1766, 70.

ERXLEBEN, Syst. Reg. Anim. 1777, 165.

SCHREBER, Säugt. III, 1778, 521; tab. cxliii, (ex Buffon.)

Gm. Syst. Nat. I, 1788, 103.

"BLUMENBACH, Abbildungen, tab. lxii."

HARLAN, F. A. 1825, 53.

Procyon lotor, STORR, "Prod. Meth. Anim. 1780."

DESMAREST, Mamm. I, 1820, 168.

GRIFFITH'S Cuv. V, 1827, 114.

RICH. F. B. A. I, 1829, 36.

FISCHER, Synopsis, 1829, 147.

DOUGHTY'S Cab. N. H. II, 1832, 73; pl. vii, (very poor figure.)

WIEGMANN, in Archiv. III, 1, 1837, 356.—*Id.* in Annals & Mag. N. H. I, 1838, 133.

WAGNER, Suppl. Schreber, II, 1841, 154.

DEKAY, N. Y. Zool. I, 1842, 26; plate.

AUD. & BACH. N. A. Quad. II, 1851, 74; pl. lxi.

Meles lotor, BODDAERT, El. Anim. I, 1784, 80.

? *Procyon gularis*, SMITH, Int. Mamm. Jard. Nat. Lib. XIII, 1842, 222.

Raccoon, PENNANT, Hist. Quad. 1781, No. 178.—In. Arctic Zool. I, 1784, 69. (In Leverian Museum.)

CHURCH, Cabinet of Quadrupeds, II, 1805; plate.

Raton, ST. HIL. & CUV. Hist. des Mammifères, II, 1819; plate, (not paged.)

Quid *Procyon brachyurus*, and *obscurus*, WIEGMANN, in Archiv, III, 1837, 369, 370.—SCHREBER, III, pl. cxliii, C.

D. (interpolated.)—WAGNER, Suppl. Schreb. II, 1841, 156, 159.

SP. CH.—General color grayish white, the tips of the long hairs black, and imparting this color to the back. Under fur dark brown. A large oblique black patch on the cheek, continuous with a paler one beneath the jaw; another behind the ear. End of muzzle, except the upper line, together with the posterior border of the cheek patch, whitish. Tail not tapering, with the tip and five annuli black; these as broad as the rusty white interspaces. Hind feet not exceeding four inches; above, dirty whitish. Fore feet not exceeding $2\frac{1}{4}$ inches.

Varies in being nearly black, with the markings obscured; sometimes more or less yellowish or white, with obsolete markings or none. A decided tendency to albinism.

In the notice of the generic character of *Procyon* will be found an account of the chief external peculiarities of this species derived from the examination of specimens in alcohol. In further illustration, I may state that the tail vertebræ are not quite half the length of the head and body, ($10\frac{1}{2}$ inches to $22\frac{1}{4}$), while the tail, with the hairs, rather exceeds half this length, ($12\frac{1}{2}$ inches to $22\frac{1}{4}$.) The length of the ear, measured on its anterior border, is just the distance from the nose to the eye.

The prevailing color of the common raccoon is a light gray, tinged with pale rusty across the shoulders, and much overlaid with black tipped hairs. The under parts are of a similar gray, without the black tips, and, like the rest of the body, allow the dull sooty brown under fur to show through. The upper surfaces of the feet are whitish gray, with a suffusion of brownish at the base. The tail exhibits five distinct black rings, with a tip of the same color; these rings are usually continuous all round, especially the four anterior ones, and there is sometimes a trace of a sixth ring at the root of the tail above. The intervals are grayish white, more or less mixed with rusty; they are usually a little wider (sometimes not at all so) than the black rings. The diameter of the brush is nearly uniform throughout, ($2\frac{1}{2}$ to 3 inches,) the end only being rounded off.

There is a dusky streak or band from the black and naked muffle along the upper line of the head, which is lost in the crown. This separates the large and nearly black spectacle-like patches which encircle the eye, (which is situated near the posterior edge,) and passing obliquely downwards and backwards over the cheeks, cease below the line of the commissure of the jaws. The anterior line of this patch is halfway between the posterior line and the end of the muzzle; the distance between the two patches above is about equal to the width of the muffle, although both are more or less confluent with the longitudinal stripe described. Posterior to the cheek patches is a conspicuous border of grayish white, lost on the sides of the neck; and the sides of the muzzle anterior to the black patch, together with the lips all round, and the chin, are of a similar whitish color. The posterior part of the chin is occupied by a broad dusky patch, which may almost be said to form part of an annulus encircling the head, of which the dark cheek patches constitute the upper portion, and are separated from the lower by the backward prolongation of the whitish of the lips. The ears are grayish white. From the inferior and posterior base of the ear there extends quite a conspicuous patch of a dark sooty color.

On a close examination of the hair of this raccoon, the colors of the exterior are seen to be due to the long stiff hairs interspersed among the basal fur. These are usually black at the extremity, particularly along the back, and subterminally annulated broadly with whitish. The base of the hair is also whitish, separated by an annulus of light brownish. The base and sub-terminal annulus are accordingly whitish; the tip and sub-basal annulus dark. On the

nape the subterminal annulus is rusty yellowish, and the basal light portion is wanting. On the sides of the shoulder the hairs are whitish, with short dusky tip. The hair in the annuli of the tail are nearly concolored throughout. The under fur is of a light sooty tinge, which is, however, much darker on the hind legs.

The preceding description may be considered as illustrating the average characteristics of the raccoon as found in the eastern States, based on skins from Washington. There are some variations in specimens which will be briefly noticed. Another from the same locality is considerably darker; the tips of the long hairs being quite black and more extensively colored on the sides of the body. On the side of the shoulders, on the contrary, they are entirely hoary white. The alternating rings on the tail are larger and better defined; there are only four well defined dark ones, and an obscure basal fifth; the terminal black tip is quite inconspicuous, and appears as if enveloped by the succeeding whitish ring. The upper surface of the paws is dirty grayish.

A third specimen, likewise from Washington, is much larger than the others, and the tail is proportionally shorter. There is a preponderance of gray on the forehead, and the cheek patch appears somewhat reduced. The paws are entirely of a dull whitish.

Specimens from St. Simon's island, Georgia, exhibit much black on the back and sides. One skin from North Carolina is entirely white, the tendency to albinism being greater in this than in almost any other native animal.

General dimensions.

	Washington, D. C. Fresh specimen, ⁸⁰⁷ / ₁₃₂₉ .		National Institute.			No. 1067.	No. 1149.
			A.	B.	C.		
	<i>Inches.</i>	<i>Lines.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
Nose to occiput	5	3	5	5	6	5½	5
eye	2	3					
ear	4	3					
root of tail	22	3	23	22½	30	20	25
end of outstretched hind legs	32	3					
Tail, from root to end of vertebræ	10	6	8½	7	9	9½	10
hairs	12	6	10	8½	11	11	12
Ears, height, posteriorly	2	6					
anteriorly	2	3	2	2	2	1¾	2½
internally above skull	2						
width	1	9					
Arm, between claws across shoulder	27						
length of fore arm	4	10					
from elbow to end of claws	6	10					
fore feet to end of claws	2	8	2½	2½	2½	2½	2¾
longest claw		6					
Leg, from knee joint to end of claws	8	9					
tibia	6						
hind foot from heel to end of claws	4		4	3¾	3½	3½	4¾
longest claw		6					

The preceding measurements of Nos. A, B, C, and 1067, were taken from dried skins ; of 1149 from a skin in alcohol ; No. 307 was measured while fresh, before skinning, and may be considered as expressing the true proportions. No. 1149 in several respects differs from the others , and in size, proportions, brown color of feet, approaches nearer to the *P. hernandezii*, which, possibly, it may prove to be.

List of specimens.

Catalogue number.	Corresponding No. of skull.	No. of specimen.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.	Collected by—
1067	.....	.....	♂	Middleboro', Mass.....	Nov. 1, 1855	J. W. P. Jenks.....	.....	Dry skin .....	.....	.....
36	933	.....	○	St. Lawrence co., N. Y. ....	.....	F. B. Hough .....	.....	do .....	.....	.....
A, B, C,	.....	3	.....	Washington, D. C. ....	.....	National Institute..	.....	Mounted .....	.....	.....
1655	.....	.....	.....	Spottsylvania co, Va.....	.....	A. W. Massey .....	.....	Skin .....	.....	.....
2342	.....	.....	.....	North Carolina.....	.....	I. W. Raymond.....	.....	Skin, albino .....	.....	.....
1608-12	.....	5	.....	St. Simon's island, Ga.....	.....	Dr. S. W. Wilson.....	.....	Skin .....	.....	.....
1912	.....	.....	○	Fort Kearney, Neb.....	July 10, 1856	Lt. F. T. Bryan.....	88	In alcohol..	3 9½ 3½ 4½	W. S. Wood ..
1875	2573	.....	♂	Ft. Riley to Ft. Kearney.	July 2, 1856	 do	53	Skin	5½ 16 8 9	 do
1876	2574	.....	♂	Republican Fork	Oct. 24, 1856	 do	392	do	8 27 9½ 12	 do
1825	.....	.....	.....	Fort Randall, Neb.....	.....	Lt. G. K. Warren.....	.....	do .....	.....	Dr. F. V. Hayden.
1149	2037	.....	.....	Wisconsin .....	.....	A. C. Barry.....	.....	Skin in alc.	.....	.....

PROCYON HERNANDEZII, Wagler.

Black-footed Raccoon.

Procyon hernandezii, WAGLER, Isis, XXIV, 1831, 514.

WIEGMANN, in Archiv, III, I, 1837, 367.—Ib. Annals and Mag. N. H. I, 1838, 133.

WAGNER, Suppl. Schreber, II, 1841, 157; also in Schreber Säugt. III, pl. cxliii, A, (interpolated.)

? *Procyon nivea*, GRAY, Charlesw. Mag. N. H. I, 1837, 580. (Albino.)

"*Tepe Maxtlaton*, HERN. Thes. 9."

Quid *Procyon psora*, GRAY, Annals and Mag. N. H. X, 1842, 261, (Sacramento river.)—Ib. Zool. Sulphur, 1844, 32; pl. xi, (animal), pl. xvii, f. 1, 2, 3, (skull).

SP. CH.—Larger than *P. lotor*. General color grayish white, with a tinge of yellowish ; long hairs tipped with black. Under fur dark brown. A large oblique black patch on the side of the face continuous with a paler one under the chin. Sides and under part of the muzzle, posterior margin of the cheek patch, and the ear, whitish. Tail tapering to tip, with five or six annuli and the tip black ; the annuli half as wide only as the rusty whitish interspaces. Hind feet exceeding four inches ; the upper surface mostly dark brown. Naked part of the soles three inches.

Varies in lighter colors and substitution of rusty brown or chestnut for the black tints.

In general appearance, this species closely resembles *P. lotor*, and its characteristics are more comparative than absolute. In size, it somewhat exceeds the *lotor*. The general color is a pale yellowish gray above and on the sides, (yellowest on the nape,) overlaid with black tips to the hairs. There is a dark brown stripe from the muffle along the top of the snout, lost in the forehead ; on each side of the face is a well defined large patch of black which passes obliquely from the stripe just mentioned over the eye, and runs off to an angle behind the commissure of the mouth. The eye is situated half its diameter within the posterior edge of the patch, the anterior edge of which is about midway between the posterior edge and the end of the snout. There is a broad bar under the chin, forming the continuation of the cheek patches, and the portions anterior to these marks being white, the effect is as if a black muzzle had been immersed

in white paint, except on the upper surface. The end of the muzzle in both jaws is white, as also a stripe extending backwards from the angle of the mouth to the sides of the neck. There is also a broad whitish border to the posterior edge of the cheek patch. The basal portion of the convexity of the ear and a patch behind and below it are sooty brown; the part projecting beyond the hair is dull whitish. The upper surface of the hind feet, except along the inner edge, is liver brown; the fore feet dull grayish. The under surfaces of the body are dull hoary. The tail is rather more than half the length of the head and body; it is moderately bushy, but narrower than in *P. lotor*, and tapers slightly to the tip. The tail itself is of a light rusty whitish, with a tip and five distinct annulations of black, and two other basal ones very obscurely indicated. The three terminal rings are distinctly continued all round; the others are merely indicated on the lower surface. The rings are narrow and quite sharply defined, scarcely more than half the width of their light interspaces.

The hairs, examined separately, are black, with the central third whitish, the basal portion rather brown than black. Occasionally the extreme roots will be whitish. On the sides there is more white in the hairs, those on the side of the shoulder being almost entirely hoary.

This species bears a very close relationship to the *P. lotor*, and without close comparison the differences are perhaps intangible. An examination, however, of a large number of North American raccoons has resulted in the appreciation of certain differences, which appear quite constant. These are as follows:

In size, *P. hernandezii* is considerably the larger of the two; no specimens examined of raccoons from the eastern United States are as large as those of corresponding ages from the west.

The feet are uniformly larger and stouter, and the bare portion of the palms extends further up the wrist. Thus the hind foot, from heel, always equals $4\frac{1}{8}$ inches, even in a specimen of only 18 inches, (exclusive of tail,) and maintaining the deciduous dentition, and sometimes exceeds $4\frac{1}{2}$ inches, while in *P. lotor* it is only in the very largest that it amounts to 4 inches, usually less. The fore foot, from the naked part of the wrist, in a soft skin, (1053,) measures three inches; in a much larger skin of *P. lotor*, only $2\frac{7}{10}$. The thumb claw does not reach the base of the claw adjacent to it, while it does in *P. lotor*.

The tail of *P. hernandezii* is, in some respects, quite different from *lotor*; it is rather longer and thinner, and tapers slightly to the tip; the black rings are narrower and better defined; the terminal three or four only encircle the tail completely; the others are indicated below by a pale brownish tint. The light intervals are wider than in *P. lotor*, being about twice as long as the dark rings, and there is rather more ferruginous intermixed.

A nearly constant difference is seen in the color of the upper surface of the hind feet. This is of a liver brown all over, except perhaps near the base of the toes on the inner side, instead of the uniform dull grayish white of *P. lotor*. This prevails in all the Texas and far western raccoons, and I have never seen even an approach to it, except in one skin from Wisconsin, where there is a slight suffusion of brown along the outer edge and at the base.

There is a decided tinge of rusty yellowish in the subterminal annulation of the hairs on the upper surface of *P. hernandezii*, so that while the tinge on the nape is as distinct in *P. lotor*, the grayer colors posterior to it render this feature more strongly marked in the last mentioned species. The ears of *P. hernandezii* are rather smaller and thinner than in the other.

The descriptions of *P. hernandezii* given by Wagler and Wiegmann agree very well with the specimens examined by me, except that there is not so decided a tapering of the tail as they would seem to indicate. The prevailing color of the back and sides I find to be a yellowish gray, and

that of *P. lotor* a grayish white, just the reverse of what is stated by the above authors. The greater purity of the white marks on the face in *P. hernandezii* I have not been able to appreciate.

Of the existence within the limits of the United States of the *Procyon cancrivorus*, as stated by Audubon and Bachman, I can find no trace. The figure given by these authors is taken from a specimen in the British Museum brought from South America, and the description from one in the Charleston Museum, likewise extra limital. Their notice of the habits and peculiarities of the California raccoon refers, in all probability, to the *P. hernandezii*, as this is the only species yet detected among the many California raccoons brought in by the different expeditions. The *P. psora* of Gray, from the Sacramento river, is, I suspect, a bleached or faded specimen of the same species, with a mutilated tail, as the generic characters of *Procyon* are partly wanting.

The *P. obscurus* and *brachyurus* of Wiegmann I am not able to identify; it is quite probable that they do not belong to North America. The characters assigned of very indistinct annulation on the tail of the one, and of extreme brevity of tail in the other, are scarcely sufficient to establish them as true species.

From the evidence at present at our command, it would seem that the Mexican raccoon is abundant as far north as the Rio Grande of Texas, and west to the Pacific, where it ranges north as far as Cape Flattery, or Puget's Sound, and possibly even further. The line of demarcation between this and the *P. lotor* to the eastward is not yet ascertained.

Measurements.

Current number.	Locality. ●	Head.	Head and body.	Tail to end of verteb.	Tail, with hairs.	Ear, (ant. edge.)	Hind ft.	Fore ft.
1053	Devil's river, Texas, (young) -----	5	19	7	8½	1¾	4.2	3.
1052	San Elizario, Texas.....	5	21	8½	9½	-----	4.4	2.6
672	Bodega, Cal.....	5½	24	9½	10½	2	4.4	3.
1196	San Francisco, Cal.....	-----	27	11	12½	2	4.5	3.
1197	Fort Jones, Cal.....	-----	27	12	13	-----	-----	-----
279	Fort Steilacoom, W. T.....	-----	27	11½	12½	2	4.5	3.2
1186	Cape Flattery, W. T., (young) -----	-----	13	5½	6½	-----	-----	-----

List of specimens.

Catal'gue number.	Corresp'ng number of skull.	No. of specim'n.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
1386-8	-----	3	-----	Matamoras, Mex.....	-----	Lt. D. N. Couch...	Skulls.....	Dr. L. Berlandier.
1052	2210	-----	-----	San Elizario, Tex....	Dec., 1854	Maj. W. H. Emory.	Mounted..	Dr. C. B. Kennerly.
1053	-----	-----	-----	Devil's river, Tex....	Nov., 1854	-----do-----	Skin in alc.	-----do-----
672	1875	-----	-----	Bodega, Cal.....	-----	Lt. W. P. Trowbridge.	Skin	T. A. Szabo
1196	2082	-----	-----	San Francisco, Cal..	-----	Lt. R. S. Williamson.	do.....	Dr. J. S. Newberry.
1197	-----	-----	-----	Fort Jones, Cal.....	-----	-----do-----	do.....	-----do-----
279	-----	-----	-----	Ft. Steilacoom, W. T.	-----	Dr. Geo. Suckley ..	do.....	-----do-----
1945	-----	-----	-----	do.....	-----	-----do-----	do.....	-----do-----
1186	-----	-----	○	Cape Flattery, W. T.	-----	Lt. W. P. Trowbridge.	do.....	-----do-----

PROCYON HERNANDEZII, var. MEXICANA.

In the Report on the Zoology of the United States and Mexican Boundary Survey will be found the description of a very light colored *Procyon*, collected by Dr. Kennerly at Espia, in Sonora. It is well figured and described by St. Hilaire, in the Voyage de la Venus, Zoologie, I, 1855, 25; tab. vi, from a specimen collected at Mazatlan. The general markings are as in *P. lotor*, but the tints are very much paler, the long hairs being tipped with dark reddish brown, instead of black. The feet are whitish above, the hinder ones with a tinge of chestnut on their outer portion. The tail has six distinct annulations of purplish chestnut, besides the tip; the intervals rusty whitish, a little larger than the dark rings.

In pattern of coloration, this specimen agrees exactly with *P. hernandezii*, as well as in the long hind feet; it is only necessary to suppose a skin of this species bleached throughout to a certain degree to present the general characters described above. I therefore, without hesitation, consider it a local variety of the *P. hernandezii*.

PROCYON PSORA, Gray.

Procyon psora, GRAY, Ann. and Mag. Nat. Hist. 1842, 261.—*Id.* Voyage of Sulphur, 1844, 32; pl. xi, (skin,) xvii, f. 1, 2, 3, (skull.)

The *Procyon psora* of Gray, based on a specimen brought from the Sacramento river, by Belcher, resembles in some respects the specimen described as above, from Sonora. The description is, however, not sufficiently perfect as to admit of a minute comparison. The colors, judging from the figure are quite similar; the black patch of the cheek, however, is smaller, and only involves the lower half of the eye; nor does there appear to be any dusky on the upper part of the muzzle. There is a yellowish tinge to the fur, due, possibly, to immersion in alcohol. The upper surface of the hind feet is whitish; the tail is reduced to a mere stump, and is probably broken off. Further specimens from California may show whether this is more than a mutilated variety. The small cheek patch and the rudimentary tail differ from the normal condition of other North American species; in the former respect resembling the *P. cancrivorus*. The dimensions given are as follows: head and body, 27 inches; tail, 3; hind foot, $4\frac{1}{2}$; skull, 5 inches long, $3\frac{1}{2}$ broad.

Upon the whole, I am inclined to consider the *P. psora* as essentially the same with the Sonora specimen, with only a smaller cheek patch; and both of them varieties of *P. hernandezii*.

URSUS, Linn.

Ursus, LINNÆUS, *Systema Naturae*, 1735.

GEN. CH.—Body thick, clumsy, and large. Feet entirely plantigrade; soles naked; nails long. Tail very short. Head very broad. Dentition: incisors $\frac{3-3}{3-3}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{2-2}{3-3} = \frac{20}{33} = 42$.

The above brief characters will serve to distinguish one of the best defined groups in the animal kingdom. The species are not numerous, nor are they to be found, except in the temperate regions of the northern hemisphere. A single species, *U. ornatus*, is found in the South American Andes. North America possesses more species than any other part of the world, having at least four, and perhaps five.

The skull of the bears is longer, and the muzzle longer and broader than in the dogs and cats. The orbital processes of the frontal bone are moderately developed, almost wanting in the very young. The intermaxillary comes into absolute contact with the frontal bone. The bony palate extends considerably behind the molar teeth. The lower jaw is massive and very high; the coronoid process subtriangular, and as long as high.

The dental formula of the bears is the same as in the majority of the *Canidae*, the molar teeth in the lower jaw attaining the maximum (seven) found in the placental mammals. It is very seldom, however, that the full number is met with, owing to the deciduous character of some of the premolars, which are very small. Indeed, in most American species, one or two of these on each side, above and below, are usually wanting, their place indicated by a small socket, which is sometimes obliterated entirely, and only a sharp bony ridge occupying its place. The second premolar of both jaws disappears, and then the third; the fourth is almost always retained, and usually the first also, which is situated very close to the canines, and generally incumbent upon them. The first three premolars above and below are very small and have but a single root; their crowns are occupied by a single compressed tubercle. The fourth tooth in both jaws is a premolar, but is much larger than those in front of it; the upper has three fangs, the lower two. The first upper molar has three roots, the second four; the first, second, and third molars have two each; those of the third connate.

The fourth upper premolar represents the sectorial tooth of the carnivora, but is here greatly reduced from its formidable homologue in the dogs; its shape is triangular, but the base of the triangle is posterior instead of anterior. The first true molar above has an oblong crown, with four principal cusps, and sundry supplementary wrinkles or irregularities. The second or posterior molar is the longest of all, and is shaped somewhat like the first molar, with an additional portion on the posterior extremity, usually subtriangular, and without prominent tubercles. In the lower jaw, the fourth lower premolar is smaller and narrower than the upper one. The first true molar is long and narrow, especially anteriorly; it still retains some of the characteristics of the same tooth in the *Canidae*, especially when viewed laterally. The second molar comes nearest the first true molar above, but is narrower; the third molar is rounded or elongated, as broad as the second molar, but shorter; its variations in comparative size furnish excellent specific characters.

The inner line of the upper molars is straight, and those of opposite sides parallel. In both upper and lower jaws, the exterior and interior outlines of each row of molars are straight and converge anteriorly, so that the teeth narrow as we proceed forwards.

The skulls of all the Carnivora vary exceedingly with different age, the shape of the individual bones, and the general proportions of the head changing in a striking degree. This is particularly the case in the bears, so much so that any reliable comparisons between different species must be based on examinations of specimens of the same age as indicated by the temporal fossæ, and the sagittal crest, as well as by the condition of the teeth. This last, however, is an uncertain basis of comparison, as the amount of attrition of the crowns of the molars and incisors depends much more upon the general nature of the food than the age. Bears in districts where animal sustenance and soft vegetables abound retain the integrity of the teeth much more than those which feed upon acorns, nuts, or other seeds requiring considerable grinding.

Another source of difficulty in the determination of species of the bears is owing to the fact that the size at maturity varies considerably in different individuals of the same species. The sexes, too, are said to differ constantly. Thus, according to Blainville, the males of both *Ursus americanus* and *U. arctos* differ from the females in having the forehead flatter and less arched transversely than in the female and young male.

The teeth, too, may vary considerably in size in two specimens of one species, where the other proportions are the same. Thus, in two skulls of *Ursus americanus*, from one locality in Louisiana, of the same size and age, the posterior upper molar of one (1154) measures 0.92 inches; that of the other, (988 ♀,) 1.10 inches. I may here mention that in No. 1154 there is one upper premolar additional to the usual number on one side, two being developed between the first and third. There are thus five premolars and two molars.

In describing the skulls of the bears it will be better to select as the type one of middle age, and afterwards indicate the variations in the very old and very young ones.

The number of species of bears belonging to North America is somewhat uncertain. Those usually assigned are the black bear, *Ursus americanus*—the grizzly, *U. horribilis*—and the polar or white sea bear, *U. maritimus*. The cinnamon bear of the Rocky Mountains has usually been considered a variety of the black bear. Skulls of a small brown bear from the Copper Mines of New Mexico, probably the cinnamon bear, show conclusively a difference of species, and the grizzly bear of the same neighborhood exhibits peculiarities not found in the grizzly of the Pacific coast. There may thus be five species, and to this we must probably add the Barren Ground bear of Richardson, referred by him to *Ursus arctos* of Europe. This may, however, prove to be the same with the small grizzly of the Rocky Mountains; in which event it must be considered as entirely distinct from *U. arctos*.

For the sake of illustrating the comparative sizes of the skull in different species of North American bears, with the relative proportions of each, I have prepared the following table, based upon selections from the large stock of specimens before me.

Comparison of skulls of different species of bears.

Current number.	Name.	Sex & age.	Locality.	Total length.	Length between condyles and intermaxillaries.	Width between zygomatica.	Height of skull.	Least width of muzzle behind incisors.
994	<i>Ursus cinnamomeus</i> ?	♀	Copper Mines, N. M.	9.80	9.20	6.00	2.80	1.95
991	do.	♂	do. (black)	11.50	10.60	6.90	3.40	2.30
992	do.	♂	do. (brown)	11.10	10.60	7.00	3.20	2.28
996	do.	♂	do.	6.60	6.20	3.50	2.50	1.60
988	<i>Ursus americanus</i>	♀	Morehouse co., La.	10.30	10.10	6.00	3.20	2.23
1154	do.	♂	Prairie Mer Rouge, La.	11.00	10.30	6.10	3.00	2.10
902	do.	♂	Pennsylvania	10.50	10.30	5.90	3.40	2.26
897	do.	♂	St. Lawrence co., N. Y.	12.00	11.10	7.60	3.40	2.50
2250	do.	♂	Saranac Lake, N. Y.	10.70	10.50	7.50	3.40	2.27
1156	do.	♂	Prairie Mer Rouge, La.	12.50	11.60	7.50	3.80	2.35
987	do.	♂	Morehouse parish, La.	12.30	11.70	7.50	3.60	2.58
1155	do.	♂	Prairie Mer Rouge, La.	12.70	11.70	7.50	4.00	2.67
2086	<i>Horribilis</i> , var. <i>horriacus</i>	♂	Los Nogales, Sonora	14.30	13.10	8.10	4.40	2.75
990	do.	♂	Copper Mines, N. M.	14.20	13.10	8.20	4.40	2.80
995	do.	♂	do.	10.30	10.20	5.70	3.10	2.07
1218	<i>Ursus horribilis</i>	♂	Upper Missouri	13.70	13.40	7.40	4.00	2.74
1220	do.	♂	Monterey, Cal.	15.20	14.60	9.37	4.90	3.05
2037	do.	♂	do.	9.90	9.70	5.20	2.90	2.40
2893	do.	♂	San Francisco, Cal.	14.10	13.70	7.20	4.10	3.10
904	<i>Ursus marinus</i>	♂	Upper Missouri	14.30	13.70	9.20	4.10	3.10
903	do.	♂	North Greenland	12.00	12.10	6.20	3.40	2.56
	do.	♂	do.	15.20	15.30	8.20	4.30	3.48

URSUS HORRIBILIS, Ord.

Grizzly Bear.

Ursus horribilis, ORD, Guthrie's Geography, 2d Am. Ed. II, 1815, 291, 299.

SAY, in Long's Exped. II, 1823, 53.

DOUGHTY's Cab. Am. N. H. I, 1830, 121; pl. xi.

GODMAN, Am. N. H. I, 1831, 131.

Ursus ferox, ("LEWIS & CLARK,") RICHARDSON, F. B. A. I, 1829, 24; pl. i.

FISCHER, Synopsis, 1829, 144.

MAXIM. Reise in das innere Nordam. I, 1839, 488.

WAGNER, Suppl. Schreb. II, 1841, 138.—*Id.* in Schreber, III, tab. cxv, C. (Copied from Richardson.)

AUD. & BACH. N. A. Quad. III, 1853, 141; pl. cxxxi.

GEOFFR. Voyage de la Venus, Zool. I, 1855, 123; pl. v. (Skeleton.)

GIEBEL, Säugt. 1855, 742.

MAX. VON WIED & MAYER, Verh. K. L. C. Akad. der Naturf. XXVI, 1857, (?) 39; pl. iii, animal;
pl. iv, skull.

Danis ferox, ("GRAY,") LESSON, Nouv. Tabl. R. A. 1842, 74.

Ursus cinereus, DESM. Mamm. I, 1820, 164.

HARLAN, F. Am. 1825, 48.

Ursus candescens, HAM. SMITH, Griff. Cuv. II, 1827, 229; V, 1827, 112. (Plate from Lewis & Clark's specimen in Philadelphia Museum.)

Ursus arctos, var., MIDDENDORFF, Sibirische Reise, II, II, 1853, 4, 54, 61.

White bear, BARTON, Phila. Med. & Phys. Jour. I, 1805, 75.

WATKIN's, Amer. Phil. Trans. VI, 1809, 70.

Grizzly, gray, white, and brown bear, LEWIS & CLARK, *passim*.

Gray bear of America, Journal de Phys. LXXXI, July, 1815, 416.

DEWITT CLINTON, Trans. N. Y. Lit. & Phil. Soc. I, 1815, 56.

SP. CH.—Size very large. Tail shorter than ears. Hair coarse, darkest near the base, with light tips. An erect mane between the shoulders. Feet very large; fore claws twice as long as the hinder ones. A dark dorsal stripe from occiput to tail, and another lateral one on each side along the flanks, obscured and nearly concealed by the light tips; intervals between the stripes lighter. All the hairs on the body brownish yellow or hoary at tips. Region around ears dusky; legs nearly black. Muzzle pale, without a darker dorsal stripe.

A young grizzly, obtained near San Francisco by Dr. Newberry, and measuring about $3\frac{1}{2}$ feet, exhibits in miniature all the peculiar characters of the species. The head is long and acute, as in young bears; the muffle is truncated and naked above for about half an inch from the tip. The nostrils are rather open, and the groove in the anterior face of the upper lip, extending to the septum, is naked. The ears are large and conspicuous above the fur; rather narrow and high, and well coated with hair. They are about three inches high above the skull, (exclusive of the hair.) The tail is shorter than the ear by nearly an inch.

The fore claws, as usual, are larger than the hinder ones. The fourth is longest, then the third, second, first, and fifth. The first claw is much the most arched and convex in its dorsal outline, and the rest become successively less and less curved; the longest measures about $2\frac{1}{4}$ inches. They are compressed to near the tips, where they are depressed and slightly rounded along the short and truncate tip; here they are not dissimilar in shape to the incisors of the beaver, though larger. The digits preserve much the same proportions as the claw, except that the fifth is rather longer than the first. The balls of the fingers are longer than broad, and are separated from the large pads by a hairy depression. The main pad is twice as broad as long, and narrows from the outside inwards. The single small circular pad near the outer edge of the foot is separated from the main pad by an interval equal to its own diameter—about one

inch. The hind foot is rather shorter than the fore feet; the proportions of the toes very similar to those of the fingers, the claws much shorter, or little over one inch. The balls of the toes are longer than wide; the outer the larger, and advancing nearly as far as the fourth or longest. The single pad on the sole is longer than wide, and somewhat shield-shaped.

A much larger specimen in Dr. Newberry's collection agrees in general characters, except that the tail is still shorter in proportion to the ear. The longest fore claw measures four inches. The sole of the hind foot is rather longer than in the young; the single large pad measuring about seven and a half inches by five.

The grizzly bears of the Pacific coast vary somewhat in tint, but maintain at the same time quite constant characters. Thus the limbs are generally black or dark brown; there is a dark stripe along the back, commencing at the occiput, and another on each flank parallel to this, and commencing behind the axillæ. The sides of the body, on either side of the dorsal stripe, are of a pale brownish yellow, with a tinge of hoary, and brightest over the shoulders, the general effect being curiously similar to what is seen in *Spermophilus douglassii*, and to a less extent in *S. beecheyi*; the distinctness of the stripe is, however, obscured by the hairs being all tipped with lighter. The belly is of a dull yellowish, as is also the head generally, which, however, occasionally, is brownish in part. There is, generally, a suffusion of brown about the ears.

There is a kind of mane on the neck, extending from the occiput to the shoulders, along which the hair is considerably longer than that on either side, especially in the adult. In the largest specimen before me these hairs of the mane are five inches long, the others only three; they are dark reddish brown at the base, shading into black to near the tip, which is pale brownish yellow. The lighter colored spaces on either side of this line are brownish ashy at the base. The remaining and largest portion dirty yellowish. The head above and sides of the neck are yellowish, the under surface of the body of a duller tint of the same. The limbs generally are blackish, with occasional tips of the dirty yellow.

In one young animal the legs are dusky, and the entire body at first sight appears of a dirty yellowish. On closer examination, however, the concealed darker dorsal stripe, and those on the flanks can be readily made out, more of the tips of the hairs generally being invaded by the yellowish.

Other still younger specimens are darker and exhibit the three longitudinal stripes very distinctly.

The largest skin of this grizzly, from California, measures 6 feet in length. From six to seven feet may be considered the maximum.

A very large specimen (2039) from the Yellowstone is nearly uniform in its colors in all parts, the body of the hairs being dark brown, the ends of the hairs dull brownish yellow. It measures about six feet to the tail which is a mere rudiment shorter than the ears.

Another specimen, (1843,) on the contrary, is much varied, the prevailing color being cinnamon brown, more yellow on the nose, flanks, and lower part of the back; the legs nearly uniform dark reddish brown. The darker hairs of the back are brownish yellow at the base, then cinnamon, and finally tipped with lighter. This specimen measures $6\frac{1}{2}$ feet.

A young animal, (1826, dressed skin,) is entirely of a whitish yellow above and on the sides, anteriorly. Another, (1830,) is almost a miniature of No. 2039, except that a dorsal dark line separates the lighter of the sides. There is, however, a distinct crescentic white patch on the side of the shoulder or a little anterior to it.

No. 1867, from the Upper Platte region, is somewhat like 2039, with rather more yellowish on the neck above; 1865 has a greater mixture of yellowish white anteriorly; while 1866, a large specimen, is as white as 1826. The legs of all, however, are uniform dark brown.

I have received from Dr. Hayden the dimensions of the claw of a grizzly killed at Fort Benton by Col. Alfred Vaughan, Indian agent. This measures $6\frac{1}{4}$ inches along its convexity, and is the largest that has come to my knowledge, though Townsend refers to one of seven inches, taken from an animal killed in the Rocky Mountains by the party to which he was attached.

There is little difficulty in distinguishing the grizzly bear in all phases of condition from the common American black bear. The size of the feet and the length of fore claws, together with the varied color of the hairs in different portions of their length, as well as in different regions, with many other features, will always answer for this purpose. Lewis and Clark, in referring to the differences of the grizzly and black bears, say that in the former the testicles are each contained in separate pouches, two to four inches apart, and placed further forward than in the black bear, in which they are contained in a single pouch, like that of a dog, and placed back between the thighs.

The definition is more difficult in regard to the *U. arctos*, or European brown bear, and some authors, as De Blainville, are quite positive as to their being identical. I have satisfied myself of a difference, from comparison of the skulls, but have never had an opportunity of examining skins of the European animal. This in size is sometimes but little inferior to the average of grizzlies, although never reaching the maximum of the latter. The fore claws and the feet are proportionally less than in the grizzly; the ears are longer. There is usually no trace in the young grizzly of the whitish collar or transverse band on the sides of the neck, nor has the distinct arrangement of color in stripes, as described in the grizzly, been observed in its European congener.

The existence of a brown bear in North America, less in size and specifically different from the grizzly, is authenticated by Richardson, who found it on several occasions in the Barren Grounds of the Arctic zone. Without being positive on the subject, he inclines to the opinion that it is the *Ursus arctos* of Europe. The naturalists of the Venus obtained a brown bear on the coasts of Kamtschatka, and carried it alive to Paris, where it was considered to be the true *Ursus arctos*. If this be so, then the American Barren Ground brown bear is probably the same species.

Middendorff,¹ in an exceedingly elaborate article on the *Ursus arctos*, in the course of which he discusses the characteristics of over fifty skulls, decides that all the European bears belong to one species, of many varieties. In comparing the grizzly bear with the *U. arctos*, he finds so few differences as to be almost inclined to consider both as the same; the size of the grizzly, as well as its weight, he thinks over estimated; and even admitting a weight of 800 pounds, mentions a bear of the Ural of this magnitude, according to Eversmann.

The long claws of the grizzly he admits to exceed those of the Old World bear, but is not certain that all of the former species have an equal development in this respect. He calls to mind the peculiar variety of the *Ursus arctos*, called *falciger* by Reichenbach on this account. He suggests that the bears of mountainous and rocky countries have longer claws than those of the plains.

The author comes finally to the conclusion that in the great length of the claws, the great

¹ Sibirische Reise, II, II, 1853, 4 and 54.

size, the usual absence of most of the small premolars, and the grayish white color of the tips of the hairs on the body, the American grizzly forms a remarkable and extreme geographical variety of the Old World, *Ursus arctos*; very closely related to the bear of the west coast of Behring's Straits, and through this and others, by insensible degrees, affiliating with the common well known brown bear.

In the lack of sufficient materials for comparing the grizzly with the Old World bear, I cannot gainsay these conclusions, although perhaps the description of skins and skulls of the American animal herein presented may throw more light on the subject.¹

Skull.—The skull of a grizzly bear from California, of middle age, (2037,) obtained at San Francisco, exhibits the teeth almost perfectly unworn, excepting the extreme points of the inner tubercles of the upper molars, and the outer of the lower. The sagittal crest extends further forward than in the smaller American bears of the same age, reaching to the coronal suture.

The upper outline of the skull is nearly straight from the occiput to the middle of the parietal crest. It then curves gently upwards, attaining its greatest elevation over the beginning of the posterior fourth of the frontal; from this it slopes downwards in a nearly straight or very gently convex line to the anterior third of the nasal, and passes off more nearly horizontally and straight. The curve is much less convex than in the *U. americanus*, and the greatest convexity of the arc of curvature, and greatest height above its chord, is in the posterior fourth instead of in the centre. The forehead is plane between the orbital processes in its central third, exterior and posterior to this it is very gently convex, much less so than in the *U. americanus*. There is a decided angular depression along the middle of the nasal bones, except in the posterior fourth, where it is much less.

The greater elongation of the skull in the grizzly bear is shown in the proportion which the width between the zygomata bears to the total length of orthographic proportion, being as 507 to 1,000, or nearly as one to two.

The zygomatic arch of this species is very little curved in either direction, being nearly straight, viewed from above, and only moderately arched. The coronoid process of the lower jaw is moderately concave on its posterior outline and forms a well defined right-angle with the superior, which curves very little downwards to meet it.

A rather older specimen from the upper Missouri, lent for examination by Dr. Stevens of St. Louis, exhibits much the same characters, although rather shorter absolutely, and broader in proportion to its length. In this and a very old specimen from Monterey, (1218,) the median sagittal crest has not advanced beyond the coronal suture, although the temporal ridges are very decided and rise above the level of the forehead. In neither of these is there any great difference in the upper profile of the head, except that in No. 1218 the forehead is more depressed, so as to cause a slight concavity from the middle of the frontal bone to the end of the nasals. The forehead between the post orbital processes is also concave transversely, the orbital process only being rounded off exteriorly. The skull has become much broader in proportion to the length. (616.)

¹ As this article is passing through the press, I have received an elaborate paper, entitled "Ueber die Selbstständigkeit der Species des *Ursus ferox*, Desm., von Prinz Max von Wied, mit anatomischen Bemerkungen von Dr. C. Mayer," an extract from the Verhandlungen der Kais. Leop. Carol. Akad. der Naturforscher, vol. XXVI. The date is not given, but it is either 1856 or 1857. The species is very elaborately discussed, both as to its external form and internal structure. The authors come to the conclusion, after reviewing all of Middendorff's arguments, that the species is essentially distinct, as a species, from the European *Ursus arctos*, especially in the shorter ears and longer claws, as well as in certain osteological peculiarities.

The skull of the grizzly bear can at all times be distinguished by its size alone from all other American species, excepting the polar bear. This, however, differs exceedingly in many respects; the muzzle is much broader and more arched; the nasal bones extend further backward. The base of the whole skull is much curved from the condyles to the incisors; the palate being excavated almost into a boat shape. Thus, a straight line extended from between the occipital condyles to the crowns of the incisors will pass more than $1\frac{1}{2}$ inches above the centre of the palate; in the grizzly bear not half an inch. The head of *U. maritimus* is much narrower, being barely more than half as wide as long. The zygomatic arches are lower and weaker.

The teeth of the polar bear, with the exception of the canines and incisors, are much smaller than in the grizzly, scarcely exceeding, in absolute dimensions, those of the common black bear. The posterior upper molar is smaller than in the average of *U. americanus*, and quite similar in shape; the posterior half of the crown is nearly horizontal. The third molar from above is much more truly sectorial than in other bears; the anterior lobe being much longer than the posterior, which is reduced to a smaller size. The horizontal section of the tooth is sub-elliptical, not triangular, and the inner tubercular lobe seen in most other species is here reduced to a basal ridge. There are also differences of importance in the lower molars in the nearly horizontal and plane crowns of the very small posterior one, the fewer tubercles of the others, the absence of distinct vertical wrinkles on the outer surfaces, &c. The incisors also differ materially. It is not necessary, however, to push further the comparison of the species.

The relationships existing between the skulls of *Ursus horribilis* and *U. arctos* of Europe are pretty close. Although our species is considerably larger, De Blainville, in his "Osteographie Comparée," as well as other authors, considers it to be a mere variety of the *U. arctos*, forgetful of the dogma of Buffon that the species of the New World are in general merely degenerate varieties of those of the Old. I have not had the opportunity of examining an adult head of *U. arctos*, but the oldest and largest figured by Blainville measures 14 inches in length and 9.3 inches in width. Thus, while the length is somewhat less, the width between the zygomata is much greater, being 0.66 of the length. In the broadest skull of *U. horribilis* before me, and one agreeing in age with Blainville's specimen, the proportion is but 0.61. This width of head far exceeding that of any well known American species, would appear to be quite conclusive as to the question of identity. Another skull of *U. arctos*, as represented in the "Osteographie," is 11.40 inches long and 7.50 inches wide, or in the proportion of 100 to 66 nearly.

In comparing a skull of the grizzly bear of California (1220) with one of *U. arctos* from Sweden, marked two years old, (No. 1033,) I find them both of nearly the same relative age, the latter a little the most forward. The last upper molar has made its appearance in both, the last lower one has its crown four-fifths exposed in *U. arctos*; in the other, with one-third visible, but not yet above the alveolus. The deciduous canines have not yet fallen in either; the outer upper incisor is not quite up in the California specimen, while it is nearly in place in the other. In these specimens the greater breadth but smaller size of the European bear is distinctly evident. The teeth are proportionally larger in the American animal; the posterior half of the last upper molar more horizontal and broader, the outer surfaces more wrinkled. The sectorial molar above is much broader in the grizzly, being nearly as wide as long, though sub-triangular in shape. In *U. arctos* this molar is proportionally longer, and little more than half as wide as long; the inner tubercle is much smaller, and in the more trenchant and compressed crown, and higher anterior lobe, resembles quite closely the corresponding tooth in the

polar bear. The premolars between this and the canines are either very small or wanting entirely in all the skulls of the grizzly, while in *arctos* there are two quite large ones.

Corresponding differences exist in the lower molars, which are largest in the American bear, though not in the same proportion as the upper. The posterior molar is much more elongated in the grizzly, equalling the second in advance of it, while in *U. arctos* it is not more than three-fourths this length. An important difference exists in the fourth molar from behind. This in both exhibits one central and elevated compressed pointed lobe. In the grizzly, there is a tubercle at the base of this lobe postero-internally, from which a low angular ridge passes to the posterior end of the tooth, parallel with a similar ridge, passing back from the lobe and a little exterior to the middle line of the tooth. These two ridges meet behind and enclose a small valley. Now, in the *U. arctos* the inner tubercle with its ridge are wanting, and there only is a central ridge along the posterior half of the tooth. In this feature of a single ridge there is quite a close agreement with the *Ursus americanus* and *cinnamomeus*. The incisor teeth seem to have much the same characters in both species.

In view of the very great difference in the size of the teeth in the smallest grizzly bear and the largest of our smaller species, it is hardly necessary to go into any detailed comparisons of the skulls of the species. The most important characteristics, independent of size, are to be found in the narrower head, straighter profile, and more flattened and concave forehead, greater proportional size of the posterior upper and lower molars, and numerous other features in the grizzly.

The following table exhibits the detailed measurements and proportions of the skull in several grizzlies, from various localities, as well as of a skull of the polar bear:

Measurements.

SKULL.	<i>Ursus horribilis.</i> 1218. Monterey, Cal.		<i>U. horribilis.</i> 2037. San Francisco.		<i>U. horribilis</i> , var. <i>horriaeus</i> . ♂ 990. Copper Mines.		<i>U. maritimus.</i> 903. N. Greenland.	
	Inches.	100ths of length.	Inches.	100ths of length.	Inches.	100ths of length.	Inches.	100ths of length.
Total length	15. 20	1. 00	14. 10	1. 00	14. 20	1. 00	15. 20	1. 00
From end of intermaxillary to end of condyle.....	14. 60	. 96	13. 70	. 97	13. 10	. 92	15. 30	1. 01
Greatest width.....	9. 37	. 61	7. 20	. 51	8. 20	. 58	8. 20	. 54
“ height above base of cranium	4. 90	. 32	4. 10	. 9	4. 40	. 30	4. 30	. 28
Distance between orbits	3. 40	. 22	2. 85	. 20	3. 10	. 21	3. 63	. 23
“ “ orbital processes.....	5. 17	. 34	3. 80	. 26	4. 70	. 33	4. 78	. 31
Nasal bones, length			3. 90	. 27			4. 30	. 28
width before	1. 40	. 09	1. 30	. 09	1. 40	. 09	1. 23	. 08
Narrowest part of muzzle behind canines	3. 05	. 20	3. 10	. 21	2. 80	. 19	3. 48	. 22
Upper incisors, from front to molars	3. 50	. 23	3. 18	. 22	3. 20	. 22	3. 56	. 23
to hinder margin of palate	7. 80	. 51	7. 00	. 49	6. 95	. 48	7. 80	. 51
width between external edges	2. 06	. 13	1. 80	. 12	1. 87	. 13	2. 00	. 13
Upper molars, length taken together.....	3. 13	. 20	3. 00	. 21	2. 80	. 19	2. 56	. 16
least distance between	2. 05	. 13	1. 80	. 12	1. 80	. 12	2. 30	. 15
From intermaxillary to end of nasals			6. 27	. 44			7. 20	. 47
“ commencement of orbit.....	6. 26	. 41	5. 60	. 39	5. 70	. 40	5. 90	. 39
Between post orbital points and occiput.....	8. 70	. 57	7. 80	. 55	7. 80	. 54	8. 60	. 56
From post orbital points to end of nasals	5. 15	. 33	4. 94	. 35	4. 64	. 32	5. 00	. 32
end of intermaxillaries.....	8. 00	. 52	7. 40	. 52	7. 40	. 53	7. 90	. 51

The range of the grizzly bear is quite extensive through North America though less so than that of the common black bear. It appears first to occur on the Missouri, above Fort Pierre, and becomes more and more abundant higher up on the Missouri, and especially on the Yellowstone; thence to the Rocky Mountains, which it inhabits throughout its entire extent in the United States. It also ranges to the Pacific, though not found on the coast north of the Columbia river. To the north it extends far into the British possessions, and southward into Mexico; how far, however, is not known.

Richardson credits Lewis and Clark with the name of *Ursus ferox*, as first applied to this animal; I have not been able to find this name in their report, and am inclined to believe it a translation by Richardson of one of their vernacular appellations. To the best of my present knowledge, the first tenable name is the one imposed by Ord as quoted above.

For a detailed account of the skull and skin of a variety of grizzly from Sonora and the Copper Mines of New Mexico, which I call *Ursus horribilis* var. *horriacus*, I refer to the report of the United States and Mexican Boundary Survey.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.	Collected by—
1199	2084	♀	Calaveras co., Cal	Nov., 1855....	Lt. R. S. Williamson.	...	Skin.....	.....	Dr. J. S. Newberry.
1274	2085	♀	do	do	do	...	..do .....	.....	.....do ..
1443	...	♀	do	do	do	...	..do .....	.....	.....do
1444	...	♀	do	do	do	...	..do .....	.....	.....do
	1219	♀	Monterey, Cal .....	.....	Lt. W. P. Trowbridge.	...	Skull. ....	.....	.....
	1220	♀	do .....	.....	.....do	...	..do .....	.....	.....
	3100	...	Petaluma, Cal .....	.....	E. Samuels	...	..do .....	.....	.....
83	...	...	Fort Union, Neb.....	.....	E. T. Denig.....	...	Skin .....	.....	.....
?1826	...	...	Bighorn river, Neb.....	Aug., 1856 ..	Lt. G. K. Warren.....	...	..do .....	.....	Dr. F. V. Hayden..
1830	...	...	Fort Clark, Neb.....	do	do	...	..do .....	.....	.....do ..
1843	...	...	do	do	do	...	..do .....	.....	.....do ..
2039	...	...	Yellowstone river	do	do	...	..do .....	.....	.....do ..
	2892	...	Fort Union, Neb.....	.....	.....do	...	Skeleton ..	.....	.....do ..
1865	2563	♀	Medicine Bow Butte, N.	Aug. 30, 1856	Lt. F. T. Bryan.....	314	Skin.....	15½ 52 2½ 6½	W. S. Wood.....
1866	2564	♀	do	do	do	315	..do	17½ 67½ 4½ 7½	do ..
1867	2565	♂	do	Aug. 27, 1856	do	311	..do	14 68½ 3 5½	do ..

URSUS AMERICANUS, Pallas.

Black Bear.

Ursus americanus, PALLAS, Spicilegia Zoologia, XIV, 1780, 6-24.

Gm. Syst. Nat. I, 1788, 101.

BODDAERT, El. Anim. I, 1784, 79.

LACEP. et CUVIER, Menagerie du Museum, 1801. Plate.

DESMAREST, Mamm. I, 1820, 165.

HARLAN, F. Atl. 1825, 51.

RICH. F. B. A. I, 1829, 14.

FISCHER, Syn. 1829, 143.

GODMAN, Am. N. H. I, 1831, 114.

F. Cuv. Suppl. Buff. I, Mamm. 1831, 352.

WAGNER, Suppl. Schreb. II, 1841, 141.—*Id.* in Schreber Säugt. III, pl. cxli, B. (No text.)

DEKAY, N. Y. Zool. I, 1842, 24, pl. vi, f. 1.

AUD. & BACH. N. A. Quad. III, 1853, 187; pl. cxli.

MAX VON WIED & MAYER, Verh. K. L. C. Akad. der Naturf. XXVI, 1857, (?) 41; pl. v. Skull.

Ursus niger, americanus, GRIFF. Cuv. V, 1827, 112.

Black bear, PENN. Hist. Quad. 1781, No. 174.—*Id.* Arctic Zoology, I, 1784, 57.

Ours noir d'Amerique, ST. HILAIRE, Cuv. Hist. Nat. des Mamm. II, 1819. Plate.

SP. CH.—Size small. Feet moderate. Fore claws not twice as long as the hinder. Color entirely uniform throughout, either black or brownish; the hairs darkest towards the tips.

No perfect specimens of the American black bear have been collected by any of the expeditions, although Dr. Newberry brought in a large robe, procured in Oregon. In this the hairs are long and rather soft, without any wool between their bases. The color is a lustrous black, with a slight tinge of brownish near the roots, the difference is, however, scarcely appreciable.

The hair of the black bear is much softer than that of the grizzly, and in the skins examined lacks the wiry wool seen among the roots of the long staple in the grizzly.

Skull.—The specimen selected as the type of the skull in this species is No. 897, from St. Lawrence county, New York. The sex is unmarked. The molar teeth are unworn, and the age may be three or four years. The sagittal crest is quite distinct over the posterior half of the parietal bone; it then sinks down, and the temporal crests proceed forward, diverging so that their inner edges are separated at the coronal suture by about half an inch.

The outline of the skull above in profile is a gentle curve from the termination of the sagittal elevated crest to the beginning of the anterior third of the nasal; the rest of the profile, at the extremities of this single curve, passes off in a gentle convexity and more horizontally. The curve forms quite a perfect arc of a circle, (a little more convex on the posterior half,) the chord of which measures about 7 inches, the ordinate, one. There is very little, if any, depression of the skull along the central line, the line of profile view coinciding almost exactly with it. The skull is entirely flat or plane above, (except a very little rising along the temporal crests,) as far as the middle of the frontal bone; there is then a slight swelling, and beyond this the bone rounds rapidly off to the orbital process and the edge of the orbits; but a central area continues flat to the end. The transverse outline between the points of the orbital processes exhibits a shallow concavity in the centre, and a rapid rounding at the extremities.

The outline from above shows the width between the zygomata to be 0.573 of the total length. The distance from the anterior point of the molar to the end of the muzzle, measured parallel to the axis of the head, is 0.332 the total length; the least width between the orbits is 0.22 of this same length; that between the points of the orbits is 0.439 of the same length.

The lower jaw is heavy and massive. The coronoid process is broad, the anterior and upper edge curving round to meet the moderately concave posterior outline at a rather obtuse angle. There is, however, no appearance of a hook.

The molars are of moderate size, the posterior lower one with the outline slightly oval, the anterior larger and flattened, the transverse diameter three-fourths the length of the longitudinal.

A younger animal from Pennsylvania has somewhat the same general characters, except that the profile curve of the forehead is less regular, and indeed is nearly straight on the anterior half. The coronoid process is considerably lower, and the posterior outline passes considerably more forwards, so that a perpendicular line, instead of falling on the anterior base of the condyle, would pass considerably in advance.

Of two specimens from Louisiana, of nearly the same age with that first described, one agrees pretty well with it; the other exhibits a gentle concavity from between the orbital processes to the end of the nasals.

In three very old specimens from Louisiana, the sagittal crest extends nearly as far as the middle of the frontal bone. In two of these there is rather more of a depression between the orbital processes than that described; the third (a male) agrees very closely. The dorsal outline is altered in all as being less convex; in one it is nearly straight from the end of the sagittal crest to the tip of the nose.

A specimen (No. 1156) has a much shorter muzzle than the others, measuring only 0.29 of the total length, instead of 0.33, as given above.

All agree in the general shape of the coronoid process as given above.

Since writing the preceding article, I have examined a skull of the black bear from Saranac Lake, New York, which exhibits some very anomalous features, greatly differing from what has been described. The chief characteristic is the enormous breadth of the head, in this respect exceeding even the *Ursus arctos* of Europe. Thus, while the total length is 10.70 inches, the width is 7.60, a proportion of 100 to 71. A larger number of specimens from this locality, may perhaps furnish the clue to this remarkable variation, which, under other circumstances, would be readily allowed as indicating a distinct species.

Measurements.

SKULL.	Ursus Americanus. Morehouse parish, La. 987. ♂.		Ursus Americanus. Saranac Lake, N. Y. 2250.	
	Inches.	100ths of length.	Inches.	100ths of length.
Total length.....	12.30	1.00	10.70	1.00
From end of intermaxillaries to end of condyles.....	11.70	.95	10.50	.98
Greatest width.....	7.50	.60	7.60	.71
height above base of cranium.....	3.60	.29	3.40	.31
Distance between orbits.....	2.80	.22	2.77	.25
orbital processes.....	3.85	.31	4.16	.38
Nasal bones, length.....	3.10	.26	2.50	.23
width before.....	1.00	.08	1.20	.11
Narrowest part of muzzle behind the canines.....	2.58	.20	2.27	.21
Upper incisors from front to molars.....	2.90	.23	2.40	.22
to hinder margin of palate.....	6.15	.50	5.33	.49
width between external edges.....	1.37	.11	1.20	.11
Upper molars, length taken together.....	2.35	.19	1.82	.17
least distance between.....	1.60	.13	1.74	.16
From intermaxillary to end of nasals.....	5.25	.42	4.40	.41
commencement of orbit.....	4.60	.37	3.70	.34
Between postorbital points to occiput.....	7.20	.58	6.40	.59
postorbital points to end of nasals.....	4.14	.33	3.37	.31
end of intermaxillary.....	6.27	.50	5.20	.48

List of specimens.

Catalogue number.	Sex & age.	Locality.	Whence obtained.	Nature of specimen.	Collected by—
2332	-----	Oregon -----	Lt. R. S. Williamson ---	Robe -----	Dr. J. S. Newberry..
2333	-----	Essex county, N. Y -----	Dr. S. E. Hale -----	Paws in alcohol ---	-----
988	♀	Prairie Mer Rouge, La-----	J. Fairie -----	Skull -----	-----
987	♂	do -----	do -----	do -----	-----
1154	-----	do -----	do -----	do -----	-----
1155	-----	do -----	do -----	do -----	-----
1156	-----	do -----	do -----	do -----	-----
902	♂	Pennsylvania -----	S. F. Baird -----	Skeleton -----	-----
897	-----	St. Lawrence county, N. Y ---	Dr. F. B. Hough -----	Skull -----	-----
2250	-----	Saranac Lake, N. Y -----	M. Baker -----	do -----	-----
2359	-----	Essex county, N. Y -----	Dr. S. E. Hale -----	do -----	-----
3061	-----	do -----	do -----	do -----	-----
1162	-----	Lake Superior -----	J. W. Foster -----	Molars -----	-----

URSUS AMERICANUS, var. CINNAMONEUS.

Cinnamon Bear.

Ursus americanus var. *cinnamomum*, AUD. & BACH. N. Am. Quad. III, 1853, 125; pl. cxxvii.

A single robe of this variety of bear was obtained in Oregon by Dr. Newberry. The hair appears rather longer and softer than that of the black bear, which, however, it closely resembles in texture. The color is a nearly uniform dark chestnut or cinnamon, with a purplish reflection in certain lights; the hairs become, however, appreciably paler towards the roots.

For a detailed description of the skull of a small brown bear from the coppermines of the Gila, referred to this species or variety, I would refer to the Zoology of the United States and Mexican Boundary Survey.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.	Collected by—
2334	Oregon -----	Lt. R. S. Williamson -----	Robe -----	Dr. J. S. Newberry ..

URSUS MARITIMUS.

Polar Bear.

Ursus maritimus, LINN. Syst. Nat. I, 1766, 70. (Under head of *U. arctos*.)

E. SABINE, App. Parry's First Voyage, 1824, 183.

RICH. App. Parry's Second Voyage, 1825, 268.—IB. F. B. A. I, 1829, 30.

HARLAN, F. A. 1825, 51.

AUD. & BACH. N. A. Quad. II, 1851, 281; pl. xci.

Ursus marinus, "PALL. Itinerary."—IB. Spicilegia Zoologia, XIV, 1780, p. 1, tab. i.

Ear scarcely as long as the tail. Thumb much shorter than the outer toe. Crown, forehead, and top of the muzzle lie in one plane. Color snow white.

I introduce this species merely for the sake of completing the record of American bears, although no specimens were collected by any of the expeditions. For a description of the skull, see its comparison with the skull of *Ursus horribilis*, as above.¹

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
904	North Greenland -----	S. Steenberg -----	Skull -----
903	-----do-----	-----do-----	-----do-----

¹ There is still another North American bear, if it be really different from the grizzly, namely, that described as *Ursus arctos*, or Barren Ground bear, by Richardson, in Fauna Boreali-Americana. Without any specimens or information other than what is detailed in Richardson, I have nothing to say on the subject.

ORDER II.

MARSUPIATA.

Implacental mammals, the young of which are brought forth prematurely, and received, in most instances, into a peculiar pouch, situated on the lower part of the abdomen of the female; both sexes are furnished with two bones, called marsupial bones, which are attached to the anterior margin of the pelvis. The brain is deficient, both in the corpus callosum and septum lucidum; the cerebrum is small, in comparison with the size of the animal, contracted in front; its surface is smooth, or presents but few convolutions; the cerebellum is entirely exposed, and has the vermiform process large in proportion to the lateral lobes; the olfactory lobes large. Two venæ cavæ enter the heart.¹

In the preceding diagnosis are embraced the chief characteristics of a very remarkable order of mammals, of which the opossum and kangaroo are familiar examples. They are most characteristic of Australia at the present day; one group is found in America, one genus, with two species, belonging to the United States. Certain species exist in the Moluccas, as well as in New Guinea.

The Marsupialia present a great variety of forms, agreeing in the characters presented above, but of totally different external appearance, and representing nearly all the other orders of mammals. Indeed, some naturalists assign them respectively to the different groups they most resemble, while others, again, give to them the position of a distinct class of implacentalia, as distinguished from the placental mammals. Thus, the Quadrumana are represented by the Phalangiers, the Carnivora by the Dasyuri, the Insectivora by the small Phascogales, the Ruminantia by the Kangaroos, and the Edentata by the Monotremes. The Cheiroptera are not represented by any known Marsupialia, and the Rodents by a single species only.

The most striking peculiarity of the Marsupialia, in addition to the pouch, consists in the premature birth of the young, and consequent imperfect state of development which they present at this period. The young of the great kangaroo, (*Macropus major*), twelve hours after birth, resembled an earth worm in the color and semi-transparency of its integument; its whole length, from nose to end of tail, did not exceed an inch and two lines.

In addition to the other differences between the placental and non-placental mammals, there are striking peculiarities to be found in the character of the teeth. While in the former the normal number of incisors in each jaw is six, in the latter they vary from ten above and eight below, to eight above and six below, or six above and two below. All Marsupialia, with very few exceptions, have four true molars.

Waterhouse considers the *Monotremata*, embracing the *Echidna* and *Ornithorynchus*, as one section of the Marsupialia, the more typical ones being divided by him into *Macropodidae*, *Peramelidae*, *Phascologyidae*, *Phalangistidae*, *Didelphidae*, and *Dasyuridae*. It is with the *Didelphidae* only that we have here to do.

¹ Waterhouse, Natural History of the Mammalia, vol. 1, 1846, page 1, from which the general remarks in this article are chiefly deriv

FAMILY.

DIDELPHIDAE.

Incisor teeth $\frac{5-5}{4-4}$, canines $\frac{1-1}{1-1}$, premolars $\frac{3-3}{3-3}$, molars $\frac{4-4}{4-4}$; feet five-toed, plantigrade; coecum moderate.

The opossums are peculiarly American animals, the various forms occurring over a great extent of both North and South America. They are usually of small size, the largest scarcely exceeding a cat in bulk, the smallest a little larger than a mouse. Their food consists chiefly of insects, small reptiles, and birds, with their eggs.

Some of the species have only a very rudimentary pouch, the mammae in which are very numerous, varying from nine to thirteen. All the *Didelphidae* may be readily distinguished from other mammals by the great number of incisors in the jaws ($\frac{10}{8}$).

The tail is generally very long, nearly naked, and covered by a scaly skin, with a few scattered hairs; as in many other Marsupialia, it is prehensile. The feet are naked beneath, five-toed, all the toes furnished with moderate claws, except the inner one of the hind foot, which has no claw.

DIDELPHYS, Linn.

Didelphys, LINN. Syst. Naturae, I, 1735.

While the genus *Didelphys*, in its widest sense, may be considered as possessing all the characters given under the family head, it is by some restricted to the species with the toes free, and the fur of the back thickly interspersed with long coarser hairs. Of quite a number of this particular group, but two belong to the United States north of Mexico—these, at the same time, being the sole North American representatives of the family.

DIDELPHYS VIRGINIANA.

Opossum.

Didelphys virginiana, SHAW, Gen. Zool. I, 1800, 473; pl. cvii.

DESM. Mamm. I, 1820, 255.

HARLAN, F. A. 1825, 119.

GRIFF. Cuv. III, 1827, 24, pl.—IB. V, 1827, 186.

TEMM. MOD. Mamm. I, 1828, 27.

FISCHER, Syn. 1829, 263.

WAGNER, Suppl. Schreb. II, 1841, 37.—IB. V, 1855, 219.

DEKAY, N. Y. Zool. I, 1842, 3; pl. xv, f. 2.

WATERHOUSE, N. H. Mamm. I, 1846, 165.

BACHMAN, Pr. A. N. S. 1848, 40. (Development.)

MICHEL, Ib. 46.

AUD. & BACH. N. A. Quad. II, 1851, 107; pl. lxvi.

GIEBEL, Säugt. 1855, 708.

BURMEISTER, Erlaut. Fauna Braziliens, 1856, 60; tab. v, vi, f. 1 and 3. (Skull.)

Didelphys marsupialis, SCHREB. Säug. III, 1778; pl. cxlv.* (The description and plate cxlv, do not refer to the species.)*Virginian opossum*, PENN. Quad. II, 1781, 301; pl. xxxiv.—IB. Arctic Zool. I, 1784, 73. (Leverian Museum.)*Opossum*, ST. HILAIRE & CUV. Hist. Mamm. III, 1819; two plates.

SP. CH.—Hairs whitish, with brown tips, imparting a dusky shade. Legs and feet uniform dark brown or black; the fingers and toes white. Head throughout yellowish white, chin and top of head scarcely darker. A dusky suffusion around the eye. Tail shorter than the head and trunk. Body with long white hairs interspersed.

Length to occiput, 5 inches; to root of tail, 20½; of tail, 14½.

In the above diagnosis I have presented the characters of this species sufficiently well for comparison with the *D. californica*, which it so greatly resembles. According to Audubon and Bachman, the Hudson river is its eastern limit; its western and southern are not defined. I have not known with certainty of its existence far west of the Missouri, nor in Texas.

The following table contains the measurements in detail of a fresh specimen from near Washington:

General dimensions.

	Inches.	Lines.		Inches.	Lines.
Nose to occiput	6	-----	Ears, width	2	7
to eye	2	7	Arm, between claws across shoulder	1	9
to ear	5	6	length of fore arm	3	9
to root of tail	19	6	from elbow to end of claws	5	3
to end of outstretched hind legs	27	-----	fore foot	2	6
Tail, from root to end of vertebræ	15	-----	longest claw	-----	-----
from root to end of hairs	15	-----	Leg, from knee joint to end of claws	6	6
Ears, height posteriorly	2	5	tibia	4	3
height anteriorly	1	9	hind foot from heel to end of claws	3	-----
height above canthus	2	2	longest claw	-----	-----
height internally above skull	-----	-----	Weight	7½ lbs.	thin.

List of specimens.

Catalogue number.	Corresponding No. of skull.	No. of specimen.	Sex & age.	Locality.	Whence obtained.	Nature of specimen.
-----	-----	-----	-----	Washington, D. C.	National Institute	Mounted
2335	-----	-----	-----	do	Market	In alcohol
484	1625	-----	♂	do	do	do
2337-9	-----	3	○	Carlisle, Pa.	S. F. Baird	do
2336	-----	-----	♀	Calcasieu, La.	G. Würdemann	do
-----	1097	-----	-----	Washington, Miss.	Col. Wailes	Skull
-----	2200	-----	-----	St. Simon's island, Ga.	S. P. Postell	do

DIDELPHYS CALIFORNICA.

Texas Possum.

Didelphys californica, BENNETT, Pr. Zool. Soc. I, 1833, 40.

WAGNER, Suppl. Schreb. III, 1843, 40.—IB. V, 1855, 223.

WATERHOUSE, N. H. Mamm. I, 1846, 476.

AUD. & BACH. N. A. Quad. III, 1854, 331.

BURMEISTER, Erlaut. Fauna Brasiliens, 1856, 63. (Seems somewhat different.)

? *Didelphys breviceps*, BENN. Pr. Zool. Soc. I, 1833, 40.

WAGNER, Suppl. Schreber, III, 1843, 40.—IB. V, 1855, 224.

WATERHOUSE, Nat. Hist. Mamm. I, 1846, 478.

AUD. & BACH. N. A. Quad. III, 1854, 224.

Didelphys pruinosa, WAGNER, Suppl. Schreber, III, 1843, 40, (note.)—IB. V, 1855.

WATERHOUSE, N. H. Mamm. I, 1846, 477.

SP. CH.—Hairs whitish with brown tips, imparting a nearly black shade. Body with numerous long white hairs mixed with the rest. Legs and feet entirely dark brown or black to the claws. Head dusky above and below, with a brown lateral streak

through the eye, and passing round behind it into the sooty of the chin and throat, enclosing an oblong white patch under the eye. Tail as long as the neck and trunk, exclusive of the head; young? with the body almost entirely black. Length to occiput, 3.80; to root of tail, 16.50; tail to tip, 11.25; fore foot, 1.50; hind foot, 2.20; height of ear, 1.40.

A much fuller description of this species, as well as of the Virginia possum, will be found in the report of the Zoology of the Mexican Boundary Survey; I only introduce here the specific characters of each.

The present species appears to replace the common possum in Texas and Mexico, as well as in California, and has, doubtless, given rise to the impression of the great range of the former species, though the two are sufficiently distinct on comparison; the most southern locality I have seen is the city of Mexico.

The *Didelphys californica* was first described by Bennett from a specimen caught in Northwestern Mexico, and subsequently received other names; the *D. breviceps*, from the same locality, is doubtless identical, as skulls of this genus vary remarkably in the same species, and the great length of the tail, given by Bennett as an important character, has been considerably reduced by the new measurement of the same specimens by Waterhouse.

The species is probably abundant in California, though I have not been able to examine any from that region.

List of specimens.

Catal'gue number.	Correspondi'g No. of skull.	No of specim'n	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Collected by—
1058	-----	-----	City of Mexico.	-----	John Potts	-----	Skin	-----
1197	-----	-----	Guyapuco, Mex.	-----	Lt. D. N. Couch	-----	Skeleton	-----
1121	138	-----	Matamoras	Feb. 1, 1853	do	26	Skin	-----
1401-7	-----	7	do	-----	do	-----	Skel. & skulls.	Dr. L. Berlandier.
1171	199	-----	Lower Rio Grande.	-----	Maj. W. H. Emory	-----	Skin	J. H. Clark

ORDER III.

RODENTIA.

Incisor teeth two in each jaw, (a second rudimentary pair behind the upper incisors in the *Leporidae*,) very large, with sharp cutting chisel shaped edges, fitted for gnawing. No canines, but a wide space without teeth between these and the molars. The condyle of the lower jaw longitudinal, rounded, having free motion, longitudinally, in the glenoid cavity.

The *Rodentia* are unmistakably characterized by the incisor teeth as given above, although in some other features they are easily distinguished from the remaining orders of mammals. They exist in all parts of the world, and are especially abundant in America, which contains nearly as many species as all the rest of the world put together. South America counts, however, more species than the northern half of the new world, the preponderance being caused principally by the large number belonging to the genus *Hesperomys*, of which our little deer—or white-footed wood mouse is a familiar example.

There are no indigenous Rodents common to Europe and North America, unless we except the beaver, which is by some authorities supposed to be the same.¹ *Spermophilus parryi* and *Fiber zibethicus*, or the muskrat, are, however, said to occur in the northeastern part of Asiatic Russia, nearest the continent of America, especially on the peninsula of Kamtschatka and islands adjacent. The statement is more certain in respect to the former than to the latter. Nor is there evidence that any North American species are found in South America, although a number extend into Mexico. There is, however, a close relationship between their families and genera, as will be seen by the following brief discussion of the distribution of the genera and species of the North American types.

Taking the families up in the order: *Sciuridae*, *Saccomyidae*, *Muridae*, *Hystricidae*, and *Leporidae*, we find the

Sciuridae especially abundant in the United States, which embraces within its limits nearly one-third of the known species, at least of the nominal ones. This development is particularly seen in *Sciurus* and *Spermophilus*, species of *Pteromys* being more numerous in Asia, and none occurring in South America. A few species of *Sciurus* are found there, but thus far no *Spermophilus*. *Tamias* is almost peculiar to North America; two species only (perhaps but one) occurring in Siberia. The genus *Castor* extends over the whole of North America and into Mexico, specimens having been received by the Smithsonian Institution from Tamaulipas, as well as from numerous points along the whole extent of the Rio Grande and Gila rivers. The same species, or a variety, occurs through the north of the Old World, although it is only on the Obi of Siberia that it constitutes an item in the fur trade. *Aplodontia*, the last genus of this family, is confined, as far as known, to Washington Territory.

Saccomyidae.—This small but natural group, well entitled to the rank of a distinct family, is, as far as known, confined entirely to America. Of the six component genera, (*Macrocolus* being a synonym of *Dipodomys*,) *Heteromys* is found in Trinidad and Central America, *Sacomys* probably in the West Indies, and *Dipodomys*, *Perognathus*, *Thomomys*, and *Geomys* in Mexico and North America. *Dipodomys*, though abundant in Mexico as far north as the Rio Grande,

¹ Some authorities consider the lemmings of America identical with European species.

does not appear to cross this river into Texas, except in the western part of the State; it extends along the Rocky Mountain range—certainly as far as 38° N., and west to the Pacific, where it reaches nearly to the Columbia river. *Perognathus*, with similar limits on the whole is found on the Missouri river as far east as Fort Union, Nebraska, though it is not known whether it occurs in a direct line between this point and Matamoras, where it has been detected by Dr. Berlandiere and Lieut. Couch.¹ *Geomys* has a more general distribution, being found in Georgia and the Gulf States, and from the region bordering the Mississippi, to the Rocky Mountains, and even almost to the Arctic Sea on the north, and to Central America on the south. All the pouched rats hitherto collected west of the Rocky Mountains, however, belong to the section *Thomomys*, which is limited eastward by the Mississippi.

Muridae.—Of this, the most extensive family of the Rodents, the North American representatives are not very numerous, being confined principally to the *Arvicolinae*. The *Dipodinae* are illustrated by the genus *Jaculus*, with one or two species, most abundant in the northern part of the continent, and extending to the Pacific. The *Ctenodactylinae* are confined to Africa. Of the *Murina* we have no Old World *Mus*; our few species of mice belonging to the American group of *Hesperomys*, which, in a small number of species, is found all over the continent to a very high latitude. It is in South America that the *Hesperomys*, in several subdivisions, reach their highest development, eighty or more species being enumerated. Of *Reithrodon*, distinguished from *Hesperomys* by the grooved upper incisor, and likewise found in South America, there are only a few North American species, belonging to the southern States and the Rocky Mountains. The *Neotoma*, with thin tails, are found in the southern States, and through Texas and northern Mexico—perhaps southern California—to the Pacific; more sparingly in the western States. A few specimens of *N. floridana* have been caught by Mr. John G. Bell near the city of New York, far out of their usual range. The bush-tailed *Neotomas* occur on the head waters of the Missouri and west to the Pacific ocean, probably also in California; their extreme northern range has not yet been ascertained. An extinct species, *N. magister*, Baird, much larger than any of those now existing, was formerly very abundant in Pennsylvania, as shown by numerous remains found in the bone caves about Carlisle, Harrisburg, and other localities. *Sigmodon* has much the same southern and southwestern distribution as *Neotoma*, though there is as yet no evidence of its occurrence west of the Rocky Mountains.

Of the remaining sections of *Muridae*, viz: *Spalacinae*, *Bathyerginae*, and *Arvicolinae*, the latter alone occurs in North America, where it is very fully represented by the genus *Arvicola*, with numerous species spread all over the continent. Here also belong *Myodes*, confined mainly to the Arctic circle, and *Fiber*, distributed as widely as *Arvicola*. The two first mentioned genera are found in Europe, but not at all in South America, nor scarcely in Mexico; the last is found only in North America.

Hystricidae.—Of this family, North America possesses but one genus, *Erethizon*, of a single sub-family, *Hystricinae*, and probably but a single species, or at most two; of upwards of eighty species enumerated in the family, but four are found in the Old World, the rest being South American, with the single northern exception just stated. Among the South American *Hystricidae* there is found the largest of living Rodents, the *Capybara*, though this, in turn, is much exceeded in size by the extinct *Castoroides*, represented in North America by *C. ohioensis*.

Leporidae.—The numerous species of hares belonging to the genus *Lepus* may be said to characterize North America above all other countries, twelve or more being enumerated. They

¹ Since this was written a species has been detected at Fort Riley, Kansas.

are spread from one end of the continent to the other, although many of them are quite limited in their distribution. But one species is mentioned as occurring in South America. Of the second genus, *Lagomys*, there is only one species known in North America, viz: *L. princeps*, or little-chief hare of the Rocky Mountains; none occur in South America.

I have thus sketched out the principal facts in regard to the distribution of the North American *Rodentia*, leaving the details for consideration under more particular heads. It is by no means unlikely that further investigation may require considerable modification in these views, in the addition of many now unknown genera and species, or in the discovery of new localities.

There are a few points in the structure of the *Rodentia* to which brief allusion may be made before proceeding to the consideration of the families composing the group. As already stated, one family, the *Leporidae*, have four incisors in the upper jaw instead of two; a second much smaller pair occurring immediately behind the first, and receiving upon their surface the end of the lower incisors. In the young hares there are six incisors at birth, or a little after, arranged in three pairs, one behind the other. The central pair soon becomes absorbed by pressure from that behind it and disappears.

In *Rodentia*, generally, the incisors of both jaws are usually very long, and describe segments of circles, which in the upper jaw are of smaller radius, but larger arc, than those in the lower. Different groups vary considerably in the point or region attained by the root of the incisors, which thus affords distinctive characters of much importance. The incisors are provided at their roots with a persistent pulp which, constantly forming new tooth substance, keeps them of the same length in supplying the wear of the incisive surfaces. The front of the incisors being composed of enamel, and the main body of it behind the enamel of dentine, the latter wears away more rapidly than the former, and thus is maintained the sharp, chisel-like edge, so necessary to the gnawing function. When one incisor becomes broken off or diseased, the corresponding one continues to grow at quite a rapid rate, and sometimes attains to a considerable length, and may even penetrate the bone or muscle in recurving. I have seen this frequently in the case of the wood-chuck, *Arctomys monax*, L., as well as in other species.

The molar teeth of the *Rodentia* vary in number from $\frac{6-6}{5-5}$ in the hares, to $\frac{3-3}{3-3}$ in the rats; sometimes, indeed, one jaw may exhibit but two teeth. In some forms they are provided, like the incisors, with a persistent pulp which keeps them growing all the time, and supplies the wear and tear of mastication; in others they are rooted, with distinct fangs, and do not continue to grow after these are fully formed. It frequently happens that, in extreme age, the first mentioned kind of molars which, in their normal state, are of uniform size, prismatic, or rounded from top to base, with a diminution in the supply of pulp, throw out short irregular fangs, approximating them in appearance to the rooted molars. The difference in symmetry and regularity, is, however, readily noticeable.

The molars of rodents, in many cases, are very complicated in their structure, and always consist of three portions; the hard enamel which in ridges or layers enfolds or covers the softer and principal component, the dentine; the cement, or *crusta petrosa*, is exterior to the enamel; sometimes forming a thin coat, perhaps only discernible near the base of the crown, (as in many rooted teeth,) and at others filling up all its outer angles and concavities. This is the case generally in the molars without roots, where, occasionally, the cement may completely encircle an island of enamel.

The relative distribution of these constituents of the molars, varying so much in pattern and outline, furnishes excellent subordinate determining characters, being remarkably constant in

the species. It is frequently necessary, however, to take into consideration the age of the animal, as, in consequence of the different elements of the teeth not being parallel to each other, they vary in their respective distances with different degrees of attrition. Again: if the enamel coats the exterior of the crown, and on the grinding surface is studded with tubercles, when these are ground off, we may find an external frame of enamel enclosing a space of dentine, which, if the enamel has dipped down deep into its substance, may still retain islands of the latter component. This condition has given rise to much confusion, and added numerous synonyms to science.

Most Rodents have the tibia and fibula distinct. In the *Muridae* and *Leporidae*, however, they are anchylosed below. All have clavicles, with a few exceptions among the *Hystricidae*, although in the hares they are very small. The normal number of digits is five to each foot; the thumb, however, is generally more or less rudimentary; on the hind foot the whole five are present in most genera, though in some only four are evident; and in others, as *Dipus*, *Cavia*, and *Dasyprocta*, there are but three. All Rodents, but the cavies and hares, can use the fore feet as instruments of prehension in conveying food to the mouth.

The intestinal canal is generally long, and provided with a distinct cœcum, except in the *Myocina*, which is without it. None of the North American Rodents, as far as known, are without a cœcum.

The systematic arrangement of the *Rodentia*, with its numerous pseudomorphous forms, has been a subject of much discussion among zoologists, whose views have varied materially, according as different characters were selected as the basis of classification. Mr. G. R. Waterhouse,¹ however, has been most successful in furnishing a natural system by which the zoological peculiarities of different groups tally remarkably well with the chief points in their geographical distribution. The structure of the skull, and especially of the lower jaw, furnished him with characters readily appreciable. In Charlesworth's Magazine, he arranged the Rodentia in three sections—*Murina*, *Hystricina*, and *Leporina*; in Johnston's Physical Atlas, however, the more natural series is adopted of *Sciuridae*, *Muridae*, *Hystricidae*, and *Leporidae*. *Geomys*, previously placed by him among the Arvicoline section of the *Muridae*, he sets aside with *Perognathus*, *Dipodomys*, *Sacomys*, and *Heteromys*, as forming a natural group of uncertain position, and in the Natural History of Mammalia, gives them the provisional name of *Sacomyina*. In this I agree fully with him, the group having certain characters common to all, and exceptional to nearly all others. I would, however, raise it to the rank of a family, and as such, of equal prominence with the four first mentioned above.

The characters of these groups are to be found in the general form, presence, or absence of cheek pouches; form of the tail; shape of teeth and skull, especially of the lower jaw, &c. They may be given briefly as follows:

I. LEPORIDÆ.—Incisors $\frac{4}{2}$, molars $\frac{6-6}{5-5}$ or $\frac{5-5}{5-5}$, rootless. Skull with the two optic foramina united. The lower jaw with very flat rami, which are of great size; *Symphysis menti* nearly horizontal; condyloid process very high and broad; the coronoid represented by a mere ridge

¹ Observations on the Rodentia, with a view to an arrangement of the group founded upon the structure of the crania. By G. R. Waterhouse. Charlesworth's Mag. of Nat. Hist. III, 1839, 90, 184, 274, 593. Also, in Annals and Magazine of Nat. Hist.

A Natural History of the Mammalia. By G. R. Waterhouse. Vol. II, containing the order Rodentia. London, 1848. H. Bailliere.

Table of the orders Rodentia and Ruminantia, Philology and Zoology, No. 5. In Keith Johnston's edition of Berhaus' Physical Atlas. Folio. Edinburgh, 1849.

on its outer side. Descending ramus very large and flat. Tibia and fibula anchylosed below. This family contains but two genera, *Lepus* and *Lagomys*, both found in North America; the former represented by many species, the latter by a single one.

II. HYSTRICIDAE.—Incisors $\frac{2}{2}$, molars $\frac{4-4}{4-4}$, with or without roots. The snout clothed with short hairs. The skull with a large ante-orbital opening in the zygomatic process of the upper maxillary; the lower jaw with the angular portion joined to the outer, not the under surface of the bony covering of the inferior incisor; tibia and fibula distinct.

Of the six sub-families of this group, *Hystricina*, *Dasyproctina*, *Echymyina*, *Octodontina*, *Chinchillina*, and *Caviina*, North America possesses but a single genus, *Erethizon*, belonging to the *Hystricina* above mentioned. Mexico has, however a second in *Cercolabes*. The entire group belongs to America, except the few species of true *Hystricina*, which are found in Asia and Africa, and some genera of *Echymyina*.

III. MURIDAE.—Incisors $\frac{2}{2}$; molars, rooted or rootless, $\frac{4-4}{3-3}$ to $\frac{2-2}{2-2}$, usually $\frac{3-3}{3-3}$; they diminish posteriorly. A conspicuous opening on the zygomatic process of the upper jaw, which is a vertical slit, widened above, except in the *Dipodina*, where it is a more expanded aperture. The coronoid and condyloid processes and descending ramus distinct and well developed, situated in nearly the same plane, the latter more or less twisted.

This family abounds in North American representatives, belonging to the sub-families of *Dipodina*, *Murina*, and *Arvicolina*. The genera are, *Jaculus* for the first; *Hesperomys*, *Reithrodon*, *Neotoma*, and *Sigmodon* for the second; and *Arvicola*, *Myodes*, and *Fiber* for the third. The *Dipodina* in some points exhibit considerable differences from the other sub-families, and may prove to be of independent rank.

IV. SACCOMYIDAE.—Incisors $\frac{2}{2}$, molars $\frac{4-4}{4-4}$, quite simple, and mostly rootless. No perforation or foramen in the zygomatic process of the upper maxillary. The auditory bullae very far back, sometimes forming part of the back of the head. The condyloid process is small; the descending ramus is twisted nearly horizontally at its upper angle, so that when viewed from above a great portion is visible with a tubercle covering the end of the incisor between it and the condyle.

On each side of the head are cheek pouches, opening externally to the mouth. Five toes to each foot; the fore feet usually with broader palms and longer claws than the hinder ones.

This very curious family is eminently characterized by its cheek pouches, which are exterior to the mouth entirely, instead of opening from within it, as in *Tamias*, *Spermophilus*, &c. The peculiarities of these pouches will be discussed more particularly hereafter.

The genera of this family are confined to North and Central America. *Geomys*, *Thomomys*, *Dipodomys*, and *Perognatus* occurring within the United States; *Heteromys* and *Sacomys*, on the other hand, being extra limital. In this country, species of this family are, however, confined mainly to the region west of the Mississippi.

V. SCIURIDAE.—Incisors $\frac{2}{2}$, molars $\frac{5-5}{4-4}$, in many American forms $\frac{4-4}{4-4}$; nearly equal in size, except the anterior, when five are present. Molars mostly rooted. No foramen in the zygomatic process of the superior maxillary; the ante-orbital foramen very small, and appearing far forward. A distinct post-orbital process in the typical forms. Lower jaw with the descending ramus broad and inflected at its lower angle.

Among the North American species of this type, there are several distinct sub-families, which will be referred to hereafter. The genera are *Sciurus*, *Pteromys*, *Tamias*, *Spermophilus*, *Cynomys*, *Arctomys*, *Aplodontia*, and *Castor*.

FAMILY.

SCIURIDAE.

Molars $\frac{5-5}{4-4}$ or $\frac{4-4}{4-4}$, rooted or rootless. No ante-orbital foramen in the anterior root of the zygoma, or else small and rounded. Tibia and fibula distinct.

The family of *Sciuridae* as above constituted, and embracing the sub-families *Sciurinae*, *Myoxinae*, and *Castorinae*, has an extensive range: the first, throughout the world; the second, in Europe, Asia, and Africa; the third, in Europe, Asia, and North America. The most prominent characters by which the sub-families may be distinguished are as follows:

Sciurinae.—A distinct post-orbital process. Molars rooted, $\frac{5-5}{4-4}$.

Myoxinae.—No post-orbital process. Molars rooted, $\frac{4-4}{4-4}$. No coecum.

Castorinae.—No post-orbital process. Molars rootless, $\frac{4-4}{4-4}$, ($\frac{5-5}{4-4}$ *Aplodontia*.)

SUB-FAMILY SCIURINAE.

Molars, $\frac{5-5}{4-4}$, (the anterior upper sometimes deciduous,) rooted; all nearly equal in size, except the anterior upper when there are five. A distinct post-orbital process of the frontal bone. The infra—or ante-orbital foramen very small, not piercing the broad plate of the zygoma, but anterior to this.

The *Sciurinae* constitute a very natural group as characterized above, although there is a great diversity of appearance between the delicately formed and graceful arboreal true squirrels, at one end of the series, and the clumsy, squat, terrestrial marmots at the other. The component genera, *Sciurus*, *Pteromys*, *Tamias*, *Spermophilus*, and *Arctomys*, are all fully represented in North America by more species than are found in other parts of the world; only one genus, *Pteromys*, having more species elsewhere than here.

The muzzle is generally broad, owing to the development of the frontal and nasal bones. The acute process of the orbital edge of the frontal, which, pointing backwards, forms the hinder upper boundary of the orbit, is a peculiarity only found elsewhere, if I am not mistaken, among the hares. The palatine surface is large and broad, on the same plane from behind the incisors; the incisive foramina far forwards and entirely in the intermaxillaries, seldom if ever passing backwards into the maxillary, which does not send forward a thin plate. The posterior margin of the palate passes considerably behind the last molar. There are two palatine foramina, either in the palato-maxillary suture or behind it.

The zygomatic process of the upper maxillary is a broad thin plate which rises obliquely from the bone, is cylindrically concave in front, and has a broad concave notch at its lower edge, the postero-inferior edge of which is on a level with the bottom of the palate internally, but externally rises somewhat above this level; superiorly, this palate reaches up nearly to the top of the skull, articulating on the edge of the muzzle with the intermaxillary. There is, usually,

no perforation in this plate at all, the infra-orbital foramen for the passage of the nerve opening far forward, except in *Tamias*, some distance beyond the molars, nearly in a line with them or just above and close to the process of the maxillary, near the palate for the attachment of the tendon. The foramen is oval, as in *Tamias*, or triangular, (*Spermophilus*), or vertically compressed, (*Sciurus*), and is situated a short distance anterior to the molars, with a bony margin, generally tubercular, below.

The malar bone is of great extent, as in the family generally. Anteriorly, it extends forward, and is wedged between the lachrymal and the maxillary; posteriorly it reaches behind further than the process of the temporal, and constitutes the outer, and in part the posterior boundary of the glenoid cavity.

The descending ramus of the lower jaw is nearly quadrate, its upper posterior angle acute and directed upwards from the line of the condyle; and the lower posterior angle rounded and directed inwards. The lines formed by the lower margin of the descending ramus on each side are nearly parallel. The horizontal rami meet in front and join by a symphysis of limited extent.

The molars are normally $\frac{5-5}{4-4}$, (sometimes, in the young? $\frac{5-5}{5-5}$). The anterior upper molar is, however, deciduous at an early age in many American squirrels, (especially the fox-colored ones,) reducing the formula to $\frac{4-4}{4-4}$. The anterior upper molar, (where there are five,) is much smaller than the rest, with a simpler crown and a single root. The other molars are simple, with three or four roots. Their crowns are rhomboidal or sub-trigonal; the grinding surface with four transverse ridges going nearly across, one on the anterior and posterior margins, and two intermediate, usually most elevated; these are sub-parallel or sub-convergent.

The body is covered with hair varying from extreme softness to great coarseness. The eyes are well developed. Ears are variable from a mere rudiment to a considerable length. Tail sometimes longer than the body, sometimes only one-tenth the length; always densely coated with hair, usually longest on the sides.

The coecum is large, the clavicles perfect, the tibia and fibula distinct, and the upper lip cleft.

In an excellent monograph of the *Spermophiles*, Brandt¹ distinguishes the squirrels proper from the marmot squirrels by certain characters which may serve to systematize and simplify the consideration of so large a group as that of the *Sciurinae*, as given above. To the squirrels proper he applies the term *Campsiurina*, which includes *Sciurus*, *Xerus*, *Pteromys*, and *Tamias*, while the *Arctomyina* embrace *Arctomys* and *Spermophilus*, with its sub-genera, *Colobotis* and *Otospermophilus*. The characters of these tribes are as follows:

Tribe I. CAMPSIURINA.—True squirrels. First upper molar much the narrowest, oblong-linear, very simple, shorter than the second, very rarely almost equal in length and about one-eighth the size, conical or sub-conical, very often deciduous. Crowns of the greater molars, except the last, sub-tetragonal or rhomboidal, a little narrowed internally, with two central folds or ridges, nearly parallel, and sometimes with one or more accessory ridges. The anterior dentiform tubercles of the lower molars exceed but slightly, or not at all, in height the height of the crowns. The ridges of the soft palate between the molars are equal in number or nearly so to the molars, quite distinct. The fourth finger often, the third not rarely, longer than the rest. Claws trigonal at the base, strongly compressed and much hooked, generally shorter than the fingers.

¹ Sur les différentes espèces des Souliks de Russie, &c., par J. F. Brandt. Bulletin Physico-Mathématique de l'Acad. Imp. des Sciences de St. Petersburg, II, 1844, 358.

Tribe II. ARCTOMYINA.—The first upper molar equal in length to the second, and about one-half or one-third the size; swollen at the base; conico-acuminate at the apex, truncate at the point, compressed and more or less lobed, more rarely simple but always with a slight pit behind. The crowns of the larger molars, except the last, are trigonal, wedge-shaped, with two shorter ridges formed by the anterior and posterior edges of the tooth itself, and two intermediate larger ones, generally quite elevated and acute. The anterior dentiform tubercles of the lower molars exceed almost twice the height of the bases of the crowns. The ridges of the soft palate between the molars almost double the molars in number and considerably approximated. The third finger always longer than the rest. Claws considerably elongated, trigonal, and dilated at the base; moderately curved.

SCIURUS, Linnaeus.

Sciurus, LINNAEUS, "Systema Naturae, 1735."

Incisors compressed. Ears long; snout and upper lip divided; tail long, nearly equalling the body, or even exceeding it in length, with long bristly hairs arranged chiefly on the sides. No cheek pouches nor extension of the skin along the sides. Inner lines of the upper molars parallel. Anterior upper molar very rudimentary or wanting. No dorsal black stripes.

This genus comprehends a large number of species, the most highly organized of which appear to occupy the chief rank among *Rodentia*. They are quite generally distributed, most abundantly in North America, although the largest species occur in the Old World. South America possesses comparatively few, its vast forests counting up scarcely more than half a dozen species.

The principal peculiarities of the skeleton, as shared by other genera, have already been adverted to. The cranium, however, has a very great development, and the edges of the frontal bone extend far over the orbits. The post-orbital processes are acute and have a considerable bend downwards. The snout is long and tapers gently to the tip; the nasal bones do not reach back to the line of the malars. They are narrowed behind, and are not more than half as wide as the upper faces of the nasal processes of the intermaxillary. The section of the nose is quadrilateral and sub-wedge-shaped, deeper than broad, and narrower below. The ante-orbital foramen is a very narrow vertical slit, situated about midway between the molars and the incisive foramina. The upper molars are normally five, although the first is always rudimentary, and sometimes entirely wanting in the adult. The second, third, and fourth molars increase gradually in width and are quadrangular; the fifth, a little less than the fourth, is sub-triangular, the anterior and exterior edges nearly straight and at right angles, the postero-internal rounded, (the reverse of *Cynomys*). The line of the molars is less than one-fifth the total length of the skull, their inner margins very slightly divergent anteriorly. The posterior end of the incisive foramen is about midway between the second molars and the incisors. The incisors are much compressed; twice as deep as broad, with very little of the colored enamel visible from the sides.

Compared with *Otospermophilus* the skull of *Sciurus* differs in being narrower, with the sides more vertical, and the cranium more capacious; the muzzle is longer; the nasal bones narrower behind; the frontal bone is broader between the ante-orbital notches and behind the post-orbital processes, which are less highly developed. The malar bone is narrower, thinner, and more vertical; its middle part is much deeper, projecting above and below, so that the continuity of outline is interrupted by an angular process, instead of the margins being parallel throughout. The ante-orbital foramen is much more anterior, as well as the tubercle behind it. The molars are much smaller, inserted less obliquely, and occupy less space in the skull. The first molar is always rudimentary, instead of being moderate in size, with a distinct ridge. The incisors are narrower, deeper, and the sides more parallel.

The other points of difference are the smaller feet and claws, usually longer and bushier tail, absence of cheek pouches, &c.

In the large number of species belonging to the genus *Sciurus* there may be recognized two distinct types: that of the large squirrels with elongated muzzle, very long bushy tail, and

maximum size, as *S. vulpinus*, *cinereus*, *carolinensis*, &c.; and that having *S. hudsonius* as its type, characterized by smaller size, shorter and thinner tail, and shorter muzzle. This shortness of the muzzle is strikingly shown in the skull, which is very broad and full, much more convex longitudinally and transversely, and with the nasal bones one fourth the length of the skull instead of one third.

The determination of the species of squirrels of North America has always been a matter of great difficulty, owing to many different reasons. The species themselves exhibit an unusual tendency to run into varieties of color, among which red, gray, and black are the predominating ones, with all possible intermediate shades; these varieties are sometimes more or less constant in particular localities, sometimes changing with every litter. I am not aware that there is any material difference of color at different seasons or ages in the same animal.

Another source of perplexity to the naturalist is the alteration in average size with the latitude. Many of our animals become smaller as we proceed southward, until, on the sea coast of Georgia, Florida, and the Gulf they reach their minimum. This is very strikingly seen in the common deer, which on the sea islands of Georgia is so small as to be readily lifted and thrown across a horse with perfect ease by a man of ordinary strength.

It is in the *Sciuridae* that, next to the deer, we find this law to prevail most decidedly. Nearly all the species of extensive north and south range will be found, on careful examination, to substantiate this position.

A similar variation in color to that of the squirrels is seen in the foxes and wolves, most strikingly in the former. It is now well known that the red, cross, and black foxes are identical in species, the same litter frequently embracing all the colors, and that some of these varieties again are more or less permanent, while the more boreal the locality the greater tendency to black. This is the case also with the squirrels, where the smaller species assume the black pelage to the greatest extent in the more northern portions of the United States.

As a general rule it may be stated that where a squirrel exhibits any annulation of the fur on the throat or belly it is a variety of some species, typical specimens of which have the under parts either uniformly white or reddish to the roots, which, however, are sometimes plumbeous. In every such instance that has come under my examination I have had no difficulty in tracing it to its proper type. Such annulation is usually accompanied by a duskier color of the pelage. The tendency to annulation below is strongest in the squirrels of the Mississippi Valley, and applies both to gray and fox-colored species. No such instances of annulation have yet come under my notice among the squirrels west of the Rocky Mountains.

As a general rule the bones of the entire skeleton of the fox squirrels, or those with rusty bellies, are red, while the white bellied varieties have them white.

After carefully examining a large number of American squirrels I have reluctantly come to the conclusion that very many of the species now borne on our scientific records must be dropped, or reduced to the position of temporary or local varieties. I hope to be relieved from the imputation of wanton and unnecessary reduction in the number of species when I state that the species already published as new by myself have in nearly every case shared the fate of others older in date. The nominal species have usually been based on the varying size or different colors of different specimens. The dusky varieties and those with the hairs of the under parts annulated have in nearly every instance been raised to the rank of a distinct species.

In the following pages it will be seen that I recognize only twelve species of squirrels as satisfactorily proved to belong to the United States, and should *S. limitis* and *castanotus* prove

to be nominal ones, as is not at all unlikely, the number will be reduced to ten from the twenty-four given by Audubon and Bachman.

There are two strongly marked groups of North American squirrels, each, perhaps, capable of subdivision; the one, embracing species largest in size, with a long, bushy and full tail as long, with the hairs, at least, as the head and body. The squirrels of the other group are much smaller, the head broader, the muzzle shorter; the tail, including the hairs, shorter than the head and body, narrow, and flattened; these form the transition to the ground squirrels and spermophiles.

The larger squirrels, again, are divisible into those with four permanent upper molars and those with five. As far as my observations have extended, the former embrace the fox squirrels, or those some varieties of which have the under parts uniform rusty red. The gray squirrels, with their black varieties, belong to the division with five upper molars. All the large western gray squirrels, with white bellies, as *Sciurus fossor*, *aberti*, and *castanonotus*, have five. I am not prepared to say that no fox-colored squirrel has five upper molars, nor that no permanently gray squirrel has four only; but such is the result of the examinations I have been able to make thus far.

The following synopsis is intended to exhibit the principal characters of the different groups and species of squirrels:

GROUP A. Squirrels of large size; tail very broad, and, with the hairs, longer than the body; soles mostly naked from the heel in summer.

Section 1. Upper molars permanently four. Running into ferruginous varieties, in which the bones are red.

Species 1. Ears and nose always white.....*S. vulpinus*.

Species 2. Ears never white; head broad; ears short, scarcely longer than the adjacent fur.....*S. cinereus*.

Species 3. Ears never white; head narrower; ears high.....*S. ludovicianus*.

Species 4. Similar to the last, but much smaller; prevailing colors cinnamon.....*S. limitis*.

Section 2. Upper molars permanently five. Ferruginous varieties rare. Colors generally gray above and white beneath. Dusky or black varieties in one species.

Species 5. Without a black lateral line; tail, even with the hairs, but little longer than the body. Above grizzled light yellow, with occasional washes of yellowish rusty gray. (Some black varieties.).....*S. carolinensis*.

Species 6. Without a black line; vertebræ of tail alone, nearly, or quite as long as the body. Above uniform grizzled dark, plumbeous gray.....*S. fossor*.

Species 7. With a black lateral line; a chestnut dorsal stripe; ears tufted...*S. aberti*.

Species 8. Similar to the last; ears not tufted.....*S. castanonotus*.

GROUP B. Squirrels of small size; tail narrow, even including the hairs, shorter than the body; muzzle short; hind feet, in summer, naked beneath for one-half or one-third their length from the heel; anterior small upper molar either wanting or, when persistent, very small and thread-like; a black stripe on the flanks; back of the ears more or less tufted in winter.

Section 1. White beneath.

- Species 9. Above black and grayish rusty, with or without a wash of ferruginous on the back; tail beneath and towards the tip uniform ferruginous to the roots of the hairs, not annulated.....*S. hudsonius*.
- Species 10. Above black and grayish rusty yellow, without any tinge of ferruginous; tail black and grayish white, without any ferruginous visible externally glossy, black near the tip*S. fremontii*.
- Species 11. Above reddish brown and black, finely mixed; no separate wash of ferruginous on the back; tail dark reddish brown towards the bases of the hairs, its exterior portion on the sides and entire tip glossy black.....*S. richardsonii*.

Section 2. Rusty beneath.

- Species 12.....*S. douglassii*.

SCIURUS VULPINUS, Gmelin.

Southern Fox Squirrel.

- Sciurus niger*, LINN. Syst. Nat. (ed. 10th,) I, 1758, 64.—IB. (ed. 12th,) I, 1766, 86.
ERXL. Syst. Anim. 1777, 417.
SCHREBER, Säug. IV, 1792, 776; pl. ccxv, ccxv^o.
SHAW, Gen. Zool. II, 1801, 139.
ORD, Guthrie's Geog. (2d Am. ed.,) II, 1815, 292.
- Sciurus vulpinus*, Gmelin, Syst. Nat. I, 1788, 147.
KERR's Linnæus, 1792, 257.
GODMAN, Am. Nat. Hist. II, 1831, 28.
- Sciurus capistratus*, Bosc, Annales du Museum, I, 1802, 181.
DESMAREST, Mammal. II, 1822, 332.
HARLAN, Fauna Americana, 1825, 175.
GRIFFITH's Cuvier, III, 1827, 178; plate.—IB. V, 1827, 253
BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 85.—IB. Charlesworth's Mag. N. H. III, 1839, 117.—
IB. Silliman's Am. Jour. Sc. XXXVII, 1839, 291.
WAGNER, Suppl. Schreber's Säugt. III, 1843, 156.—IB. in Atlas Schreb. Säugt. IV; tab. ccxiii, B. (Gray variety, no text.)
AUD. & BACH. N. A. Quad. II, 1851, 132; pl. lxxviii.
- ? *Sciurus rufiventer*, McMURTRIE's Cuvier, I, 1831, 433. (Not of Desmarest.)
- Sciurus texianus*, BACH. Pr. Zool. Soc. Lond. VI, 1838, 86.—IB. Charles. Mag. N. H. III, 1839, 154.—IB. Silliman's Am. Jour. Sc. XXXVII, 1839, 295.
- The Black Squirrel*, CATESBY's Carolina, II, 1731, 73; pl. lxxiii. (Original of the description of Linnaeus.)
PENNANT, Hist. Quad. 1781, No. 273.—IB. Arctic Zoology, I, 1784, 119.
- ?? *Gray Squirrel*, CATESBY's Carolina, II, 1731, 74; pl. lxxiv.
PENNANT, Synopsis, 1771, 282. (These descriptions, with that of the cat squirrel of Pennant, are very vague, and may refer almost as well to this as to the *Sciurus cinereus*.)
- Capistrate*, ♂, St. HILAIRE & CUVIER, Hist. Nat. Mammif. III, 1819, (plate and text.)

SP. CH.—Tail vertebrae shorter than the body and head; with the hairs, longer. Head rather slender, and more pointed. Ears not tufted. Tail rather cylindrical. Length to root of tail about 12 inches; tail 15 inches. Hind feet 3 inches; skull 2.75 inches. Color varying from gray above and white beneath, through various shades of rusty to pure uniform lustrous black; ears, and generally nose, always white.

This squirrel is the largest North American species that has fallen under my notice, and though one of the most variable in some respects, is yet easily identified through all its changes by the almost constant presence of white nose and ears. I have not had an opportunity of examining fresh specimens of the species, or even perfect alcoholic ones, but am inclined to consider it as rather more slender than the other American fox squirrels, with narrower head

and more cylindrical tail. The tail, with the hairs, is appreciably longer than the body, the vertebral portion shorter.

The fur is very coarse and harsh, with little under fur, as would naturally be expected from its southern habitat. The ears are short and almost buried in the fur of the nape; they are moderately coated with hair, and there is a woolly tuft at the base of the ear behind. The soles are naked in summer, in winter coated with short hairs, except on the long callosity on the inner edge of the sole and near and on the tubercles at the bases of the toes.

Among the specimens before me the following variations of color occur:

1. Entirely black. No annulation on any of the hairs, even on the tail. Muzzle, end of chin and ears whitish; feet grizzled grayish white towards the claws, soles naked. No. 344 South Carolina.

2. Black, except the sides of body from the armpits and the posterior half of the back, which are annulated, grizzled reddish or rusty white and black; darkest along the median line. Tail white on the exterior, then black; bases of the hairs pale rufous. Ears and nose whitish; toes grizzled; soles naked. 1634, Florida. No. 2350, from New Orleans, is similar, with more gray above and on the sides; the tail redder.

3. Grizzled gray and black above; white beneath. Head black. Hairs of tail white, with a median broad annulation of black. No rufous anywhere. Ears and nose white. Feet grizzled whitish. Soles hairy between the tubercles nearly to the end of the metatarsus. No. 95, southern States. 1483, Columbus, Georgia. This last specimen has two annuli of black on the tail instead of one.

4. White beneath, grizzled gray and black above, varying in the series to grizzled rusty and black. Top of head grizzled black; region of ears, a narrow line along the flanks, and the light portion of the caudal hairs pale rusty. Ears and nose white. A small patch of hairs only in the centre of the sole. Numbers 1281, 1282, 1283, 1284, Tarboro', N. C.

5. Similar to series 3, with a wash of rusty above, pale rusty beneath and on the tail. Ears and nose white. Soles naked beneath. No. 1633; Florida.

6. Similar to the last, but still redder beneath the tail, with a great deal of black; the lighter portion of a dark purplish chestnut. No. 2349, New Orleans; Nos. 1280, 1285, Tarboro', N. C.

The above variations, though probably far from all that the species presents, are yet sufficient to exhibit the great differences of different specimens, scarcely two of which are exactly alike. According to Dr. Bachman, our highest authority on American squirrels, certain localities are characterized by the existence of fox squirrels of particular colors, which, at times, appear to present tolerably permanent varieties, although, according to the same author, nothing is more common than to find the same litter composed of gray, black, and fox-colored young.

This unquestioned identity of species in the great variations of color in the southern fox squirrel is of great importance, as furnishing a test by which to determine the validity of the many species of North American squirrels, based merely on differences of color; and has a particular reference to those black squirrels of the north, in which the color is uniform glossy black, without any trace of annulation anywhere. This character, however, is found equally in the southern fox squirrel, which, like the other species, passes through specimens in which the annulation is seen on a part of the body only to those where every hair exhibits it.

The skull of this species is longer, although considerably more slender, than that of the cat squirrel. Like it, it has but four permanent molars on either side of the upper jaw, except, perhaps, in very young individuals.

The first binomial name applied to this species was, unquestionably, that of *S. niger*, of Linnaeus, based on the "*black squirrel*," of Catesby, from Carolina, with white nose and ears. As, however, the term applies only to a single stage of coloration, and not even to a particular or permanent variety, it cannot be retained. The name next in order is *S. vulpinus* of Gmelin, a translation of its generally received vernacular appellation.

The gray squirrel of Catesby and Pennant may be inserted here, although usually ranged under *S. cinereus*; the descriptions are, however, so vague as to apply almost equally well to either.

The *Sciurus texianus*, of Bachman, is stated by its author, North American Quadrupeds, III, 344, to be a variety of *S. vulpinus*. The locality of Mexico, as originally given, is probably erroneous, unless the specimen in the Paris museum may have come from northeastern Texas, then part of Mexico. I am not aware that the *S. vulpinus* is found west of Louisiana, nor does it appear to reach far from the Gulf of Mexico to the north. I have seen no specimens from north of North Carolina. The *Sciurus variegatus* of some authors belongs here.

This fox squirrel is found as far north as North Carolina, possibly as far as the Great Dismal Swamp. It occurs throughout Georgia, Florida, and the Gulf States, but is said not to extend beyond the Brazos river of Texas.

List of specimens.

Catalogue number.	Number of specimens.	Locality.	Whence obtained.	Nature of specimen.	Measurements.						
					Nose to—		Tail to end of—		Hind ft.	Skull—	
					Occip.	Tail.	Verteb.	Hairs.		Length.	Width.
1280-1285	6	Tarboro', N. C.	J. L. Bridger	Dry skin	3.00	15. (?)	10.75	14.50	3.00	.....	.....
344		South Carolina	J. J. Audubon	do	2.60	13.66	11.25	15.25	3.00	.....	.....
95		Southern States	Phil. Acad. N. Sc.	do	2.70	14.50	12.00	16.00	3.20	.....	.....
1633		Florida	W. Savery	do .....	.....	13.50	11.50	15.00	.....	.....	.....
1634		do	do	do .....	.....	.....	10.25	14.00	3.00	.....	.....
1483		Columbus, Ga.	Dr. W. Gesner	do .....	.....	.....	.....	.....	.....	.....	.....
2349		New Orleans	N. O. Acad. of Sciences.	Skin, in alcohol .....	.....	.....	.....	.....	.....	.....	.....
2350		do	do	do .....	.....	.....	.....	.....	.....	.....	.....
2284		Tarboro', N. C.	J. L. Bridger	Skeleton .....	.....	.....	.....	.....	.....	2.75	1.50

¹ Much stretched.

SCIURUS CINEREUS.

Fox or Cat Squirrel, of Pennsylvania, Maryland, and Virginia.

Sciurus cinereus, LINNAEUS, Syst. Nat. (ed. 10th) I, 1758, 64.—IB. (ed. 12th) I, 1766, 86.

ERXLEBEN, Syst. Anim. 1777, 418.

GMELIN, Syst. Nat. 1, 1788, 147.

SCHREBER, Säugt. IV, 1792, 766; pl. ccxiii. (*Virginische graue Eichhorn*, in the text.)

SHAW, Gen. Zool. II, 1801, 137. (From Pennant.)

GODMAN, Am. N. H. II, 129.

BACHMAN, Pr. Zool. Soc. Lon. VI, 1838, 89.—IB. Charlesw. Mag. N. H. III, April, 1839, 159.—

IB. Silliman's Am. Jour. Sc. XXXVII, 1839, 297.

WAGNER, Suppl. Schreber, III, 1843, 158.

AUD. & BACH. N. Am. Quad. I, 1849, 145; pl. xvii.

Sciurus cinereus, KENNICOTT, Mammals Illinois, U. S. Patent Off. Rep. 1856, Agricul. 1857. (Plate, wood cut figure from life.)

Sciurus vulpinus, SCHREBER, Säugt. IV, 1792, 772; pl. ccxv. B. (Fox colored var. brought by Schoepf from Baltimore.)

?? DEKAY, N. Y. Zool. I, 1842, 59; pl. xviii, f. 3.

Sciurus virginianus, KERR's Linnaeus, 1792, 259.

? *Sciurus hyemalis*, ORD, Guthrie's Geog. (2d. Am. ed.) II, 1815, 292, 304.

The gray fox squirrel, CATESBY'S N. H. Carolina, II, 1731, 74; tab. lxxiv. (This may possibly belong to *S. vulpinus*.)

Cut squirrel, PENNANT, Arctic Zoology, I, 1794, 119. (May belong to *S. vulpinus*.)

?? *Gray squirrel*, PENNANT, Hist. Quad. 1781, No. 272.—IB. Arctic Zool. I, 1784, 116. (A mixture of *S. carolinensis*, *cinereus*, and *vulpinus*; refers best to the first.)

SP. CH.—Tail vertebrae shorter; tail, with the hairs, considerably longer than the head and body. Head very broad, with short muzzle. Ears low, broad, with the backs covered with long hairs. Body very heavy and thick. Tail flattened, ample. Length about 11 or 12 inches; tail about 14. Hind foot usually not exceeding 2.90 inches; skull 2.65 inches. Color varying from light gray above and white beneath, through various shades of pale rusty, to a grizzly hue above, and black belly. No pure black varieties noticed. Ears and (usually) nose, never white.

This species presents so many modifications of color as to render it exceedingly difficult to characterize. The fur is coarse and stiff, less rigid, however, than in *S. vulpinus*. The ears are short and broad, rounded, and coated on their convexity with long and rather woolly hairs. They are shorter and more tufted than in *S. vulpinus*. There is a longer tuft of woolly hairs at the base of the ear. Tail moderately long; not very bushy, but flattened. Palms naked. Soles partly hairy under the metatarsals, the large tubercle and the end of metatarsals with their callosities being naked. This character, however, varies with the season. On the fore feet the 4th toe is longest, then the 3d, 5th, and 2d. On the hind foot the 4th toe is longest, the 3d and 2d are successively a little shorter, 5th next; the 1st is shortest, its claw scarcely reaching to the base of that of the 5th.

In one specimen the soft fur of the back is lead color at the base, then pale yellowish brown. Towards the rump and on the sides this terminal color is more vivid. The long hairs are plumbeous at base, then black for most of the length, then grayish white, with a narrow tip of black. The hairs on the belly are lead colored at the base, then dull cinnamon. Interspersed are some hairs having an annulus of black about the middle. The hairs on the sides of the tail are pale cinnamon, with the bars of black, the exterior are subterminal and broadest, the others narrower; beneath, the hairs are nearly uniform with a few faint annuli.

The general color above is a grayish white, with a faint gloss of rusty, and mixed with black. There is a strong blackish tinge by the admixture of black hairs on the top and sides of the head. The under parts are yellowish cinnamon, the ears similar but paler. (No. 22, Carlisle, Pennsylvania.)

Another specimen from Carlisle is similar above and on the tail. The belly, however, is black, mixed with obscure rusty in places, the hairs generally being lead colored at the base, then brownish rusty, and tipped with black. The legs are black all over, except along the flanks, which are like the back and on the upper part of the feet, where rusty hairs are intermixed. The sides and underneath the head are glossy black, except a patch in front of the ear. The basal portion of the ear externally is black, the superior, pale rusty. Nose black. The soles have less hair than in the last specimen. (No. 345, Carlisle, Pennsylvania.)

Another specimen is somewhat similar to the preceding, but the black of the under parts is mixed with ash and gray. On the legs are long hairs of the latter color. The tail is more

deeply ferruginous ; its lateral hairs have only *one* subterminal black bar, very distinct ; those above have two ; those beneath show a very inconspicuous subterminal black bar. The backs of the ears are densely coated with long hair, longest on the posterior half, and projecting backwards, (not vertically,) in tufts. The soles are densely hairy to the tubercles at the base of the toes, except the large central one. The ears are black externally, like the sides of head ; the long hairs under are chestnut ; the nose is white. The color above is a pale cinnamon. The fur is long and full. (No. 39, Washington. Winter of 1852.)

Specimens from Prince George's county, Maryland, are more "foxy" than any described. Above, the general color is a yellowish gray, mixed with black ; beneath, of a pale ferruginous ; the legs and ears similar but brighter. The tail still deeper in its fox color, with three annulations of black, one sometimes very indistinct. In two males, the soles are slightly hairy as stated ; in one female they are entirely naked. The nose is similar in color to the rest of the head. (Nos. 294, 295, 296. Price Georges, Maryland. Mr. Plummer.)

There are several specimens of the cat squirrel belonging to the Philadelphia Academy of Natural Sciences, in which the colors above are of a very bright grizzled hoary white, with much less gray even than in the common gray squirrel. The under parts are of a pure white. There is nothing to distinguish them from the *Sciurus carolinensis* to the eye of a casual observer, except the stouter thicker body, shorter ears, and absence of any rusty stripe on the sides, or wash on the back.

This species is generally known in southeastern Pennsylvania and Maryland, where it chiefly abounds, as the fox squirrel ; I have never heard it called cat squirrel, as given by Bachman. Its range appears to be quite limited, though I can give no reliable information in this respect beyond what is furnished by the list of specimens. I am told that it is not found in Georgia, nor perhaps as far north as New York, except in very rare instances. In the Ohio and Mississippi it is replaced by a different species, likewise called fox squirrel.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	Whence obtained.	Nature of specimen.	Measurements.						
						Nose to—		Tail to end of—		Hind ft.	Skull—	
22			Carlisle, Pa	S. F. Baird	Dry skin	2.70	11.50		12.00	2.90		
345			do.	do.	do.	2.70	11.00	9.00	11.00	2.90		
294			Prince George's, Md	Mr. Plummer	do.			9.40	13.20	2.85		
295			do.	do.	do.		12.20	8.90	11.00	2.75		
296			do.	do.	do.			10.00	11.40	2.80		
339	932	♂	Washington, D. C.	Market.	do.	3.20	15.25	11.00	15.00	2.90	2.65	1.55
2380			do		Skin, in alcohol.			10.00	13.50	2.95		
2938			Clarke co., Va.	Dr. Kennerly	Dry skin			10.80	14.75	2.80		
756			Carlisle, Pa	S. F. Baird	Skull						2.63	1.54
855			Eastern shore, Md	do.	do.						2.57	

¹Much stretched.

SCIURUS LUDOVICIANUS, Custis.

Western Fox Squirrel.

RED VARIETY.

Sciurus ludovicianus, PETER CUSTIS, Barton's Medical and Physical Journal, II, II, 1806, 43. (Red river of Louisiana.)

HARLAN, Fauna Americana, 1825, 186.

GRIFFITH'S Cuv. V, 1827, 254.

FISCHER, Synopsis, 1829, 351.

Sciurus rufiventer, ("GEOFF. Mus. Par.") DESMAREST, Mammal. II, 1822, 332. (New Orleans.)

"GEOFFROY, Nouv. Dict. d'Hist. Nat. X, 103."

HARLAN, Fauna Americana, 1825, 176.

FISCHER, Synopsis Mammalium, 1829, 351.

SCHINZ, Synopsis Mamm. II, 1845-6. (Original description from a large Missouri specimen.)

Sciurus macroura, SAY, Long's Exped. R. Mts. I, 1823, 115. (Above mouth of Kansas river.)

Sciurus macrourus, DOUGHTY, Cab. N. H. I, 1830, 265; pl. xxiii.

F. Cuv. Suppl. Buffon, I, Mam. 1831, 297.

Sciurus macroureus, GODMAN, Am. N. H. II, 1826, 134.

Sciurus magnicaudatus, HARLAN, F. Am. 1825, 178.

GRIFFITH'S Cuv. V, 1827, 255.

FISCHER, Synopsis, 1829, 351.

BACHMAN, Pr. Zool. Soc. Lond. VI, Aug. 1838, 88.—*IB.* Charlesw. Mag. N. H. III, April, 1838, 156.—*IB.* Sill. Am. Jour. Sc. XXXVII, 1839, 296.

WAGNER, Suppl. Schreb. III, 1843, 166.

SCHINZ, Synop. Mamm. II, 1845, 11.

KENNICOTT, Mamm. Illinois, U. S. Pat. Report, 1856, Agricultural. (1857,) 56; pl. vi. (Wood-cut. Original figure from life.)

Sciurus sayi, AUD. & BACH. N. Am. Quad. II, 1851, 274; pl. lxxxix. (Missouri squirrel.)

Sciurus subauratus, BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 87.—*IB.* Charles. Mag. N. H. III, 1839, 155.—*IB.* Am. Jour. Sc. XXXVII, 1839, 295.

WAGNER, Suppl. Schreber, III, 1843, 164.

AUD. & BACH. N. Am. Quad. II, 1851, 67; pl. lviii. (New Orleans and Louisiana.)

Sciurus rubicaudatus, AUD. & BACH. N. A. Quad. II, 1851, 30; pl. lv. (Illinois and Kentucky.)

?? *Sciurus limitis*, BAIRD, Pr. A. N. Sc. Phil. VII, April, 1855, 331. (Devil's river, Texas.)

?? *Sciurus lewisii*, HAM. SMITH, Griffiths' Cuv. III, 1827, 190; plate.

WAGNER, Suppl. Schreb. III, 1843, 182.

SCHINZ, Syn. Mamm. II, 1845, 13. (From specimen in Paris Museum.)

DUSKY VARIETY.

Sciurus auduboni, BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 97.—*IB.* Charlesworth's Mag. N. H. III, 1839, 378.

WAGNER, Suppl. Schreb. III, 1843, 175.

AUD. & BACH. N. Am. Quad. III, 1854, 260; pl. clii, fig. 2.

? *Sciurus occidentalis*, AUD. & BACH. J. A. N. Sc. Phil. VIII, II, 1842, 317.

SP. CH.—Tail, with the hairs, but little longer than the head and body. Head rather slender, with somewhat acute muzzle. Ears rather narrow and high, not tufted on the back. Tail broad and full. Length about 11 or 12 inches; tail but little longer. Hind foot usually not exceeding 2.80 inches; skull, 2.60. Varies in being smaller in the south.

Color usually grizzled rusty gray above; beneath, body and tail bright ferruginous. Belly sometimes black. Sometimes dusky all over, with the belly chocolate brown annulated. No pure black nor white bellied varieties seen. Nose and ears never white.

This species is among the most variable in color, as well as size, of all the American squirrels, these peculiarities, as might have been expected, having given rise to a great many synonymes. As in some other species the more northern specimens are the larger, and the fox color varies from pale yellowish rusty to rather deep ferruginous; sometimes again, the animal is dusky

throughout, and all these phases of size and coloration have had different names assigned to them.

The western fox squirrel is among the largest of the American species, being only exceeded by the fox squirrels of the Atlantic States; it is, however, a little smaller than the California gray squirrel.

The head of this species is rather narrower than that of the Pennsylvania fox squirrel, *S. cinereus*, the muzzle longer and more attenuated, the ears higher, narrower, and projecting more above the fur of the nape. The back of the ear is coated, generally, with compact short hairs, though sometimes these lengthen, especially in winter, so as to form slight tufts; there is also more or less of a woolly tuft adjacent to the base of the ear behind.

The tail of this species is very long and ample, the vertebral portion shorter than the head and body; with the hairs it is longer. In length of tail this species exceeds the *S. cinereus*.

The feet are large, the soles naked in summer, more or less densely furred in winter, agreeing in this respect with nearly all the North American species.

The colors of this squirrel, as already stated, vary very much, although the foxy type generally predominates. The most usual condition is a grizzled black gray and rusty above, the whole under parts of body and tail uniformly yellowish red, without any annulation. The lateral and superior hairs of the tail are, however, variously annulated. The shade of color in this respect varies very much.

The more prominent varieties of the species are as follows:

1. The typical coloration as described, with the under parts uniform foxy, &c.¹
2. The colors above and on the tail as described; the whole under surfaces, with the inside of the limbs, uniformly black, without annulation. (Nos. 179, Racine; 1983, Illinois; 1346, St. Louis.)
3. Similar to the preceding; but the hairs of the under parts annulated with rusty, although the black greatly preponderates. (No. 2352, from Iowa.)
4. A single specimen, No. 2300, received from Prairie Mer Rouge, with a number of fox-colored skins, exactly similar in all specific features, agrees perfectly with the description of *S. auduboni*, of Bachman, in having the upper parts more dusky, the belly of a dark chocolate brown, all the hairs annulated with black, as on the back. The hairs of the tail are more finely annulated than in the red variety.

I have never seen any specimens of this species pure grizzled gray above, without a mixture of red or pure white beneath, as in *S. vulpinus* and *cinereus*; nor, as in the former species, is the color, as far as my observations extend, ever entirely black, with the hairs unicolor to the roots, as in *S. vulpinus*. The species, therefore, does not present as great extremes in coloration as do the two others just mentioned.

I am not prepared to say that there may not be two fox-colored squirrels in the Mississippi Valley, one more southern than the other; but investigations conducted mainly on dried specimens have not satisfied me that there are more than one. I have not the slightest doubt,

¹ A winter specimen from Fort Des Moines, Iowa, (2553,) has the fur much fuller and softer than in any others I have ever seen, with a peculiar tinge of purplish red beneath, especially on the tail. In a summer specimen from the same locality (2695) the color is a light yellow all over, paler beneath, the tips of the long hairs above nearly white. The hairs of the tail are of a darker shade or a yellowish rusty. All the caudal hairs, both above and below, are perfectly uniform to the roots, without any annulation whatever; nor is there any annulation on the back, the tips of the hairs only being lighter.

however, that the dusky squirrel from Louisiana is identical specifically with the fox-colored ones from the same locality, and that the same name must be borne by both.

It will be seen from the table of measurements that the western fox squirrel follows the same law as the other American species in the diminishing size as the locality is more southern. This is most strikingly shown in the varying length of the hind foot. The table, however, can only be considered as approximately accurate, owing to the fact that most of the measurements were taken from dried skins. Next to the hind foot, the length of the tail to the end of the vertebrae and of the hairs is the most reliable measurement of the skin; the length of body varies exceedingly with the amount of stretching or stuffing, while a skin long preserved in alcohol may shrink far within its original dimensions.

Measurements from alcoholic specimens.

Current number.	Locality.	Sex.	Tip of nose to—				Tail to end of—		Length of—			Nature of specimen.
			Eye.	Ear.	Occip.	Tail.	Vert.	Hairs.	Fore ft.	Hind ft.		
2371	Cook co., Ill.	♂	1.20	2.60	2.75	11.	10.	11.	1.85	2.80	Fox..	Entire, alcohol.
2372	Jackson co., Ill..	♂	1.30	2.50	2.75	12.	-----	14.75	1.85	2.85	Fox..	Skin, alcohol.

Measurements of skulls.

Current number.	Locality.	Sex.	Length.	Width.
1879	Illinois -----	♂	2.60	1.46
2488	Burlington, Iowa -----	-----	2.62	1.59
1765	St. Louis -----	-----	2.60	1.50
1240	Western Missouri -----	-----	2.50	1.38
1241	-----do -----	-----	2.50	1.38
1143	Prairie Mer Rouge, La. -----	-----	2.55	1.42
1205	-----do -----	-----	2.62	-----
3132	-----do -----	-----	2.57	1.48
3131	-----do -----	-----	2.55	-----

This beautiful squirrel is generally known throughout the southwestern and western States under the name of fox squirrel, a term derived from the pale rusty or fox-color of its under parts and tail. There are, as already mentioned, two other species going by the same name: one confined pretty much to the coast regions of the southern Atlantic and Gulf States; the other found chiefly in Pennsylvania, Maryland, and Virginia.

From the list of synonyms at the head of this article, it will be seen that I have thrown a great many supposed species of American authors under one name, and I trust I shall not be accused of any wanton action in so doing. With probably the largest collection of fox-colored squirrels before me ever gathered together, and those from wide-spread localities, I have found it entirely impossible to distinguish the differences referred to, especially as series from the same locality exhibited every shade of color, from dark chestnut, through bright brick red, to

pale rusty yellow. Similar differences in size occurred, although an average diminution in size was discernible in the specimens from more southern localities. I have, therefore, had no other alternative than to combine all in one, and to seek for a name among the earlier descriptions of authors. This I found in the journal of Peter Custis, an emigrant from Accomac county, Virginia, to Louisiana, published in Barton's Philadelphia Medical and Surgical Journal, as quoted above. The description fortunately is sufficiently explicit to admit of no misunderstanding. The author was familiar with the fox squirrel of the eastern shore of Virginia, (*S. cinereus*, but by him called *S. vulpinus*,) and to it he compared his Louisiana species, giving the same size for both, but referring to the deeper red color and not bearded ears.¹ A numerous series of specimens from Red river, sent by Mr. James Fairey, and almost from Mr. Custis' locality, furnishes the most satisfactory proof of the identity of this species with the fox squirrels of the Missouri river. These were called, successively, *S. macroura*, *macroureus*, *magnicaudatus*, and *sayi*. More northern ones were described as *S. rubicaudatus* while the smaller size, from near New Orleans, and resembling those from Red river, were called *S. subauratus*.

It is quite possible that the squirrel I described, from Devil's river, Texas, in 1855, under the name of *Sciurus limitis*, may be a very small variety of the present species, although its geographical distribution is in its favor, as well as much smaller size, and different color. Further collections, from western Texas, will be necessary to settle the question.

The *Sciurus lewisii*, of Hamilton Smith, described from a specimen in Peale's museum, brought by Lewis & Clark, in some respects resembles the present species, especially in the ochraceous belly and feet. The tail is described as thick, cylindrical, and bushy, and ringed with seven black and six white bands, with a white tip. This ringed character may have been produced by a twisting of the tail. I do not, however, understand the absence of any red in the tail. Unless, however, the specimen in Peale's museum belonged to this species, I cannot refer it to any known North American species; and, at the same time, it is quite improbable that a squirrel of these characteristics could exist at the present day without having been detected by some of the numerous recent explorations in the west.

I have very little doubt that the *Sciurus auduboni*, of Bachman, is the dusky variety of the *S. ludovicianus*, as a skin from Red river, sent by Mr. Fairey, in company with a large number of fox squirrels, agrees exactly with his description. The *S. occidentalis*, though originally described as from the Pacific coast, has recently (Aud. & Bach. N. Am. Quad. III, 354) been given as a synonym of *S. auduboni* by its author, and, consequently, of *S. ludovicianus*.

Mr. Robert Kennicott, of West Northfield, Illinois, one of the most observing and accurate naturalists in the west, after a careful study of many fox squirrels from and in different localities, both living and dead, has come to the conclusion that the *S. sayi*, *subauratus*, and *rubicaudatus*, of Audubon and Bachman, are all of the same species, and has described them as such in his paper on the Rodents of Illinois, in the Agricultural Report of the Patent Office for 1856, illustrated by an excellent figure taken from life.

The *Sciurus rufiventer*, of Desmarest, if really from New Orleans, in all probability belongs to this same species, although it has been referred to the *S. fuliginosus* of Bachman. The dimensions, as stated, ($6\frac{1}{2}$ inches,) are, in all probability, an error of the original description.

¹ The description is as follows: "Size of *S. vulpinus*.—Body and upper parts of tail, dark gray; belly, inside of legs, and thighs, and under part of tail, reddish brown; ears not bearded; tail longer than the body, and very broad." Red river of Louisiana.

List of specimens.

Catalogue number.	Corresponding number of skull.	Age and sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of hind foot.	Collected by—
174			Port Clinton, Ohio.		Dr. Kirtland	Dry Skin			9.50	12.00	2.75	
175			do.		do.	do.	14.50	8.00	10.50			
2351			Ann Arbor, Mich.		C. Fox	do.	12.50				2.68	
2345			Illinois bay		Dr. Kirtland	Mounted						
2346			do.		do.	do.						
170			Milwaukee, Wis.	Spring.	S. Sercomb.	Dry skin	13.00	10.00	13.50	2.90		
172			do.		do.	do.		10.00	13.50	2.85		
171			Racine, Wis.		Dr. P. R. Hoy.	do.		9.50	12.20	2.80		
179 ¹			do.	Summer	do.	do.	13.50	9.80	12.00	2.70		
1151			do.		A. C. Barry.	Skin in alc.	2.60	11.00		12.00	2.85	
2371		♂	West Northfield, Ill.	March, 1857.	R. Kennicott	Entire in alc.	2.75	11.00	10.00	11.00	2.80	
719			do.	Winter, 1854	do.	Dry skin	2.60	11.00	9.45	12.00	2.88	
724	1879	♂	do.	Spring	do.	do.			8.45	11.50	2.58	
725			do.	do.	do.	do.			8.50	11.50	2.70	
718			do.	1855	do.	do.	2.50	12.00	8.50	11.00	2.90	
1983 ¹			do.		do.	do.	2.40	9.50			2.70	
781		♂	Tremont, Ill.	Jan., 1855.	W. J. Shaw	do.			10.45	13.00	2.80	
2372		♂	Jackson, Ill.		R. Kennicott.	Skin in alc.	2.75	12.00		14.75	2.85	
1665	2488		Burlington, Iowa		T. Glover.	Dry skin						
1125		♀	Fort Des Moines, Iowa.	Autumn, 1855	W. E. Moore	do.			9.00	12.00	2.80	
1124		♂	do.	do.	do.	do.	2.40	12.00	8.20	11.00	2.70	
2352 ²			do.		do.	do.						
2353			do.		George N. Lawrence.	do.	2.60	11.50	7.00		2.60	W. E. Moore.
2695 ³			do.		do.	do.						do.
616		♂	St. Louis, Mo.		Dr. George Engelmann.	do.	2.60	11.50	10.00	13.50	2.80	
617		♂	do.		do.	do.			10.50	13.25	2.80	
1201		♂	do.	Dec., 1855.	do.	do.		12.00	10.00	12.20	2.88	
1202		♂	do.	Nov., 1855	do.	do.		12.50	8.50	13.00	2.68	
1203		♂	do.	do.	do.	do.			8.50	11.50	2.60	
1206		♂	do.		do.	do.			8.50	11.80	2.75	
1344			do.	Winter, 1855	do.	do.			8.50	12.70	2.70	
1345			do.	do.	do.	do.			9.00	12.00	2.85	
1346 ⁴			do.	do.	do.	do.	2.60	13.00	10.00	13.00	2.90	
321	1240		Western Missouri.	June, 1854.	Dr. Hoy	Mounted						
322	1241		do.		do.	do.						
1495			Lexington, Mo.	Apr. 19, 1856	Lt. G. K. Warren, U.S.A.	Dry skin.	2.50	11.25	10.00	13.00	2.80	Dr. F. V. Hayden.
1496			do.	do.	do.	do.						do.
718			Fort Leavenworth.	Nov. 27, 1854	Lt. D. N. Couch, U.S.A.	do.		12.00	8.50	12.00	2.50	
1821			Fort Randall, Neb.		Lt. G. K. Warren, U.S.A.	do.		14.00	7.75	12.00	2.38	do.
1822			Mouth of Vermillion.		do.	do.			9.00	11.00	2.60	
101			Prairie Mer Rouge, (Morehouse parish,) La.		James Fairie.	do.					2.90	
252	1204		do.		do.	do.						
253	1205		do.		do.	do.		11.20	7.00	9.80	2.60	
329	1248		do.		do.	Mounted		11.00	8.25	12.00	2.40	
2296			do.	Winter	do.	Dry skin.		12.50	9.25	12.50	2.75	
2297			do.	do.	do.	do.		12.00	8.65	12.00	2.75	
2298			do.	do.	do.	do.		12.00	7.80	11.50	2.50	
2299			do.	do.	do.	do.			8.75	12.00	2.56	
2300 ⁵	3132		do.	do.	do.	do.			8.00	12.00	2.60	
2301	3131		do.	do.	do.	do.			8.80	13.00	2.60	
2302			do.	do.	do.	do.		10.20	8.90	12.00	2.55	
2404	3149		Red Fork of Arkansas		Dr. Woodhouse	Mounted.						
1650			Fort Chadbourne, Tex.		Dr. Swift, U.S.A.	Dry skin.			9.00	11.90	2.38	
2355			Brazos river, Tex.		Capt. R. B. Marcy, U.S.A.	do.						
2354			Guadalupe Bottom, (near Indianola.)	Apr. 6, 1855.	Capt. J. Pope, U.S.A.	do.		11.00	8.00	11.50		
1729			Texas.	1854	do.	do.		14.50	7.50	10.20	2.40	

¹ Belly black, not annulated. ² Belly black, annulated with rusty. ³ Yellowish, without annulation anywhere. Black belly. ⁵ Dusky.

SCIURUS LIMITIS, Baird.

Texas Fox Squirrel.

Sciurus limitis, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 331. (Devil's river, Texas.)

Length about 10 inches. Hind foot 1.66 inches. Size less than *S. carolinensis*. Upper molars four. Hairs short and close pressed. Ears long, coated with very short hairs. Feet small; soles naked and dark brown. Above, mixed cinnamon. Tail, cinnamon beneath; above and on the sides like the back, with three annulations of black.

A full description of this squirrel will be found in the report on the zoology of the United States and Mexican Boundary Survey.

Notwithstanding the marked difference in color and size between this species and all the other American fox squirrels, I am far from feeling sure now that it is anything but a local variety of the common western fox squirrel. Had I deferred characterizing the species until the present time I should hardly have ventured upon a new name with a more ample knowledge of the North American squirrels than I possessed two years ago. I only retain it now provisionally, until its real character can be better tested by additional specimens. The locality is considerably further west than that of any fox squirrels that have fallen under my notice.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.	Collected by—
351	1265	Devil's river, Texas.	Col. J. D. Graham, U. S. A.	Skin.	J. H. Clark.
1415	2258	do	Major W. H. Emory, U. S. A.	do	Dr. C. B. Kennerly.
? —		Western Texas.	Captain J. Pope, U. S. A.	do	

SCIURUS CAROLINENSIS, G m.

Gray Squirrel and Black Squirrel.

SMALL SOUTHERN VARIETY.

Sciurus carolinensis, GMELIN, Syst. Nat. I, 1788, 143.
BACHMAN, Pr. Zool. Soc. Lond. VI, Aug. 1838, 94.—IB. Charlesw. Mag. III, July, 1839, 330.—
IB. Silliman's Am. J. Sc. XXXVII, 1839, 304.
AUD. & BACH. N. Am. Quad. I, 1849, 55; pl. vii.
? *Sciurus cinereus*, DESM. Mamm. II, 1822, 332.
GRIFF. Cuv. V, 1727, 254.
Lesser Gray Squirrel, PENNANT, Synopsis, 1771, 283 —IB. Hist. Quad. 1781.
Hudson Squirrel, var. a, Carolina, PENNANT; Arctic Zool. I, 1784, 116.
Ecureuil gris de la Carolina, St. HILAIRE & CUV. Hist. Mamm. III. Two plates and text.

LARGER NORTHERN VARIETY.

Sciurus cinereus, SCHREBER, Säugt. IV, 1792, 766; pl. cexiii. (Original and accurate description; the figure from Buffon.)
HARLAN, Fauna Americana, 1825, 173.
FISCHER, Synopsis, 1829, 352.
THOMPSON, N. H. Vermont, 1842, 45.

Sciurus carolinensis, GODMAN, Am. N. H. II, 131.

DOUGHTY's Cabinet N. H. II, 1832, 240; pl. xxi.

Sciurus leucotis, GAPPER, Zool. Jour. V, 1830, 206; pl. xi.

BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 91.—*IB.* Charlesw. Mag. III, 1839, 220.—*IB.* Sill. Am. Jour. Sc. XXXVII, 1839, 298.

DEKAY, N. Y. Zool. I, 1842, 57; pl. xviii, f. 1.

WAGNER, Suppl. Schreb. III, 1843, 160.

? *Sciurus vulpinus*, DEKAY, N. Y. Zool. I, 1842, 59.

Sciurus migratorius, AUD. & BACH. N. Am. Quad. I, 1849, 265; pl. xxv.

KENNICOTT, U. S. Patent Office Report, Agricultural for 1856, (1857,) 62; pl. vi, (from life.)

BLACK AND DUSKY VARIETIES.

Sciurus pennsylvanicus, ORD, Guthrie's Geography, (2d Am. ed.) II, 1815, 292.

Sciurus niger, GODMAN, Am. Nat. Hist. II, 133. (Not *S. niger* of Linnaeus.)

GAPPER, Zool. Jour. V, 1830, 206.

BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 96.—*IB.* Charlesw. Mag. Nat. Hist. III, 1839, 335.—*IB.* Silliman's Am. Jour. Sc. XXXVII, 1839, 307.

DEKAY, N. Y. Zool. I, 1842, 60; pl. xvii, f. 1.

THOMPSON, Nat. Hist. Vermont, 1842, 45.

WAGNER, Suppl. Schreber III, 1843, 172.

AUD. & BACH., N. Am. Quad. I, 1849, 261; pl. xxxiv.

? *Sciurus fuliginosus*, BACH. Pr. Zool. Soc. Lond. VI, Aug. 1838, 97.—*IB.* Charlesworth's Mag. N. H. III, 1839, 380.

WAGNER, Suppl. Schreb. III, 1843, 176.

AUD. & BACH., N. Am. Quad. III, 1853, 240; pl. cxlix, f. 2. (Small southern variety?)

SP. CH.—Body from 9 to 11 inches long; tail usually about an inch longer. Hind feet, 2.40 to 2.70 inches long. Skull about 2.50. Of largest size in the north.

GRAY VARIETY.—Above, grizzled light yellowish gray; beneath, pure white. A yellowish brown wash of greater or less extent on the back, and separating the colors of the belly and sides. Back of ears and adjacent region of the occiput usually with a white woolly tuft.

DUSKY VARIETY.—Varies from pure jet black everywhere, through annulations on both surfaces of body, to a grizzled grey above, with the belly white, and only an occasional patch, especially on the throat, yellowish or brownish, annulated.

Tail longer than the body. Ears very high, narrow, and acute, with sparse short hairs on the exterior surface or concavity; internally, on their margins and tip they are coated with short brownish hairs which scarcely project beyond the margins of the ears. The base and middle portion, however, of the ear is coated with a dense bunch of whitish woolly fur, forming a very conspicuous mark. The tail is longer than the body, not bushy, but flattened. The feet are quite large, and the claws strong and much curved. The thumb is a rudimentary callosity, with a broad, flat nail; the fourth finger is very slightly longer than the third; the fifth or outer but little shorter than the second, each reaching to the base of the claw of the adjacent toe. The palms are naked. On the hind foot the third and fourth toes and claws are equal and longest; the second but little shorter; the fifth reaches to the base of the claw of the fourth, and the first barely to the base of the claw of the fifth. The soles are partly naked beneath the metatarsals; the exterior half, however, rather thickly covered with short hairs, which are still more sparse everywhere else, even under the toes, except on the tubercles, which are naked.

The whiskers are longer than the head. The fore legs have long whisker-like hairs projecting far beyond the fur; similar hairs are visible on the belly.

The upper parts and sides generally are of a light ash gray, mixed with black and light brown. The dorsal surface from head to tail, a saddle mark across the back behind the fore

legs, the sides of the head, the anterior portion of the ears, the anterior and posterior edges of the fore limbs externally, a narrow line across the flanks, and the exterior surface of the hind feet extending a short distance up on the leg, are of a yellowish brown; the fore feet are grayish; the whole under parts are clear white tinged with ashy posteriorly, the hairs being uniform white to their bases. Above, the hairs are dark lead color at base, then light brownish yellow, then black and tipped with ashy white, except where the yellowish brown markings are seen, when this color forms the tip.

The tail is rather flat and distichous, not bushy; viewed from below, the hairs extended, the ground color is brownish yellow, with three narrow and well defined lines of black on each side, margined for rather more than one-fourth with white. The inner black line is some distance from the central line of the tail. The upper part of the tail has the hairs as on the sides, with perhaps fewer annulations, and a few interspersed which are black except at tip; the prevailing tint above is a mixed heavy black and yellowish brown.

Another specimen agrees in every respect, except that the ground color of the tail is darker.

Measurements.

	Washington, D. C.		Washington, Nov. 16, 1854, fresh.	
	Inches.	Lines.	Inches.	Lines.
Nose to occiput	2	7	2	6
to eye	1	2		
to ear	2	2		
to root of tail	10	3	9	
to end of outstretched hind legs	16	1		
Tail from root to end of vertebræ	7	6	8	6
from root to end of hairs	10	6	11	4
greatest width				4
Ears, height posteriorly	1	2		
height anteriorly	1	1		
internally above skull	1	2		
above the head				9
greatest height externally from bottom of lowest notch			1	2
width		8		
Arm, between claws, across shoulder	12			
length of forearm	2	1		
from elbow to end of claws	3	5		
hand from wrist			1	8
fore foot to end of claws	1	8		
longest claw		4		
Leg, from knee joint to end of claws	5	2		
tibia	3	2		
hindfoot from heel to end of claws	2	5	2	6
longest claw		4		
Longest toe from base				10
Width of head between zygomata			1	4

In the preceding portion of this article I have described, at considerable length, fresh specimens of the common gray squirrel of the United States. As is well known, Dr. Bachman has

separated the northern and southern gray squirrels from each other, mainly on account of the difference in size, and other characters, as given. With every disposition to rely implicitly on the judgment of this most excellent naturalist, I have been unable, after examining the very large series of specimens enumerated in the accompanying lists, to come to the same conclusion. I recognize, indeed, a larger size of the gray squirrel at the north than in the south; but this is in accordance with the law so well ascertained in regard to nearly all our mammals and many of our birds that have an extensive northern and southern habitat at the same season of the year. Of the difference in habits I am unable to judge from want of personal experience, but in all characters of external form, color, and proportions, I can find no features by which the gray squirrels of one region can be distinguished from those of another. In absolute size there is an appreciable difference between skins from extreme localities, and it is not a little remarkable that the very largest specimens come from the central portions of Iowa, where also the fox squirrels and the common gray rabbit have likewise the same superior magnitude to corresponding individuals from other regions. The variations in absolute dimensions are, however, very appreciable in specimens from the same locality, being quite as great as in picked specimens from different points. There is, however, no question of the greater average size of the gray squirrel in the north, and of its diminishing size as we proceed southward. I have accordingly selected a specimen from Washington, as the basis of the description, as furnishing a mean between the extremes.

Not only have I felt constrained to unite the northern and southern gray squirrels as the same species, but a careful examination of a large number of specimens before me has convinced me that the supposed permanently black squirrel of the north is, in reality, only a black variety of the gray. I am not at present prepared to say whether the same animal passes through several stages of color until it becomes uniformly lustrous black, but the specimens at hand clearly exhibit a gentle gradation from the jet black to the pure gray. I may here remark, that the white tuft at the end of the tail of the black squirrel, as mentioned by Dr. Bachman, is far from constant, many more being without it than with it.

A series of specimens now before me show very clearly the transition from the jet black color to the unquestionable gray.

1st. Color jet black throughout, even to the bases of the hairs of both surfaces. Not the slightest trace of annulation anywhere, even on the tail. A tuft of white hairs in the tip of the tail, as in the black foxes. Ears with very short hairs. Soles nearly naked. (No. 1276, Racine.)

2d. Precisely similar to the last, save in the absence of the terminal white tuft to the tail. Soles even more naked. (No. 972, ♀, West Northfield, Illinois.)

3d. Precisely similar to the preceding above on the sides and in the tail. The hairs, however, on the under surfaces, from the lower part of the neck to anus, are black, annulated faintly subterminally with yellowish brown. Soles naked. (No. 1057, Chicago.)

4th. In this specimen the central line of the back alone is unmixed and uniform black to the bases of the hairs. The hairs of the tail show obsolete annulations of yellowish brown, only indistinctly clouding the black. The narrow subterminal annulations of the hairs on the upper part of the sides and sides of the back are less distinct and narrower than on the belly. (No. 954, Racine, Wisconsin.)

5th. In this specimen the brown annulation has invaded all the hairs of the back. Tips of the caudal hairs faintly washed with brown, but not distinctly annulated. The soles are quite

hairy around the naked tubercles, and the hairs on the ears longer than in the preceding (summer?) specimens. Killed December 3, 1852. Head, 3 inches; head and body, 11; tail vertebræ, 9; tail vertebræ, with hairs, 11. (No. 178, Detroit, Michigan.)

6th. Similar to the last, but tail distinctly annulated with brown. Soles more hairy. The hairs of the convexity of the ear still longer. (Winter, No. 720, Cook county, Illinois.)

7th. Colors above lighter, like a rather dusky gray squirrel. Hairs on the under surface of body with more brownish rusty; less black. Tail hairs annulated distinctly; their tips whitish or rusty gray. Soles more naked. Hair on the ears shorter. (Spring, No. 721, Cook county, Illinois.)

8th. General character that of a gray squirrel. Nose, inside of thighs, and region around genitalia dusky. Hairs annulated. Under surface, from chin to thighs, brownish rusty. The hairs annulated or tipped with blackish; a narrow streak on each side the median line of the belly grayish white. Tail as in gray squirrels. Soles naked. (July, 1853, ♂, No. 256, Racine; 257 similar.)

9th. Similar to the last, but with no dusky on the inside of the thighs. Hairs of under surfaces only annulated on the throat and neck, where they are tinged with gamboge yellow. (No. 970, West Northfield, Illinois.) Another specimen with the light stripes on the belly larger, purer white, and confluent in places. The region around the teats is, however, more dusky than elsewhere. (No. 1136, Fort des Moines, Iowa.)

10th. Chin and inside of the fore legs suffused with brownish; an indistinct stripe of pale brown on each side of the median line of the belly. No annulation of inferior hairs. (No. 1672, Carlisle, Pa.)

11th. The next stage is the regular gray squirrel, in which the prevailing color of the hairs above is gray, with subterminal annulations of black, more or less concealed by the gray tips. The entire under parts are white; the sides of the white with a narrow margin on the flanks of yellowish rusty. This color also overlays the gray of the upper parts in varying proportions, sometimes confined to the head; sometimes along the middle of the back as a narrow stripe; sometimes as a broader one; sometimes forming a cross across the shoulders; sometimes forming a uniform wash over the whole surface. The proportion of yellow also varies considerably.

The ears are generally of a yellowish brown color, rather lighter at the posterior surface. In summer, the hair is everywhere very short, and uniform in length. With the approach of cold weather, it lengthens on the convex postero-internal surface of the ear, except along a narrow anterior margin. A similar lengthening takes place in a small patch on the neck at the base of the ear behind. These lengthened hairs, being white and woolly in appearance, form a conspicuous mark, not nearly so appreciable, if at all, in summer. The extreme border of the ear, however, (about one-tenth to one-twentieth of an inch wide,) remains short-haired, and of a rusty yellow color, strongly contrasted against the woolly white.

Coincident with this change of hair on the ears is a similar one on the soles. In summer these are entirely free from hair, except for about half an inch from the extreme heel, which is densely furred. The naked space commences in a transverse line about as far behind the posterior tubercle as its own length. With the approach of cold weather, hairs begin to grow on the soles until, in midwinter, they are completely covered with close, short hairs, except on the five large tubercles and the balls of the toes, and perhaps a short distance behind them. In many cases, too, a similar development of hairs takes place between the tubercles of the palms.

Although in more northern specimens the amount of growth of fur on the ears and soles is

greater than in southern, corresponding alterations take place in all, as well as the other changes indicated, except that the black and dusky varieties are seldom seen in the south.

In all the gray, black, and dusky squirrels I have seen, the small upper molar anterior to the series (of five) is persistent throughout. There are slight variations in different specimens of the same series, but I cannot realize the characters distinguishing the *S. migratorius* and *carolinensis* of Bachman. An examination of a large number from the same locality shows great differences, especially in the length and width of the muzzle and its several bones.

All the American fox squirrels I have seen show but four upper molars.

Under the supposition, as stated in the preceding pages, that the two gray squirrels described by Bachman are really no more than local varieties in size of one species of different latitudes, and that the black and dusky northern squirrels are also the same, I have arranged the synonyms under the three heads of small gray, large gray, and black or dusky squirrel. It appears that Gmelin was the first to characterize the small gray squirrel under the name of *S. carolinensis*. Other authors applied the name of *S. cinereus*, properly belonging to a different species, to both varieties, as, indeed, was done with the *S. carolinensis*. In 1839, Gapper described the northern gray as *S. leucotis*, to which Audubon and Bachman, in 1849, added the name of *S. migratorius*.

The name of "*Sciurus niger*, Linn." has been very erroneously assigned to the black variety of this species, instead of being restricted as a synonym to the black variety of *S. vulpinus*. The first name actually assigned to the black gray squirrel was *S. pennsylvanicus*, of Ord.

I have given the *Sciurus fuliginosus* of Bachman as a synonym of *S. carolinensis*, believing it to be nothing more than the dusky variety of the southern gray. It is very similar in all respects but size to the black squirrels of the north, and the annulation of the under fur is quite enough to indicate that it is a variety, and not a distinct and permanent species. The fact that no such variety has been detected in the south Atlantic States is no evidence to the contrary, as these varieties of color and size are more or less local, and black or even dusky varieties of the northern gray squirrel seldom, if ever, occur in eastern Pennsylvania, Maryland, or Virginia. Besides, we know so little of the zoology of Florida and Georgia, that a small dusky squirrel might abound there, and not yet have been brought to the notice of the naturalist.

The range of this species is indicated, as far as I can speak with precision, by the accompanying list of specimens.

List of specimens. (Gray squirrels.)

Catalogue number.	Corresponding No. of skull.	No. of specimen.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.							
									Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore ft., length.	Hind feet, length.	Skull, length.	Skull, width.
318				Liberty county, Ga...	May, 1854	Maj. J. Leconte....		Dry skin...		9.00				2.40		
1277				Charleston, S. C....	December....	Prof. F. S. Holmes...		do....		10.50	7.00	10.00		2.50		
1278				Tarboro', N. O....		J. L. Bridger....		do....			8.00	11.00				
1279				do....		do....		do....								
485	1623	♂		Washington, D. C....	Jan. 31, 1855	Market....		do....		10.50				2.65	2.45	1.36
486	1627	♂		do....	do....	do....		do....		10.50				2.60	2.41	1.33
208				do....	Nov., 1854	do....		do....		9.00	8.00	10.00		2.50		
907	1953	♂		do....	Oct. 22, 1855	do....		do....	2.50	10.00	8.00	11.00		2.30	2.42	1.25
1293	2025	♂		do....	Jan., 1856	do....		do....		10.50				2.60	2.40	1.31
2373				do....		do....		Skin in alc.	2.40	11.00		11.00		2.50		
2374				do....		do....		do....	2.50	10.00		11.25		2.55		
2375				do....		do....		Entire....	2.70	10.00	8.00	10.75		2.50		
2381				do....		do....		do....	2.35	9.00	8.00	10.50		2.50		
1403	2237			do....		Mr. Digges....		Skin in alc.			9.50	11.50		2.60	2.38	1.33
96				Carlisle, Pa....		S. F. Baird....		Dry skin....						2.50		
1672	2494	♀		do....	Sept. 5, 1856	do....		do....		10.00	8.00	11.00		2.55	2.41	1.35
2382				Bradford county, Pa.		C. C. Martin....		Skin in alc.	2.60	11.00				2.40		
2405				New Orleans....		N. O. Acad. Sciences.		do....								
2406				do....		do....		do....								
2378				Monticello, Miss....		Miss H. Teunison....		do....	2.30	10.50						
2379				do....		do....		do....	2.50			10.50		2.50		
326	1245			Prairie Mer Rouge, La.	1853....	J. Fairie....		Mounted....								
327	1246			do....		do....		do....							2.27	1.30
328	1247			do....		do....		do....							2.25	1.25
255	1207			do....		do....		Dry skin....						2.35	2.20	1.34
254	1206			do....		do....		do....						2.35	2.24	1.31
769				Union county, Ill....	Sept., 1855	R. Kennicott....		do....		10.00				2.50		
2376		♀		Jackson county, Ill....		do....		Skin in alc.	2.50	10.00		11.00		2.55		
2377		♀		do....		do....		do....	2.40	10.00		11.25		2.40		
1204		♂		St. Louis, Mo....	Dec., 1854	Dr. Engelmann....		Dry skin....		10.00				2.40		
1205		♂		do....	Nov., 1854	do....		do....		10.50				2.50		
324	1243			Western Missouri....	June, 1854	Dr. Hoy....		Mounted....							2.42	1.35
325	1244			do....	do....	do....		do....							2.38	1.31
323	1242			do....	do....	do....		do....							2.38	1.36
715		♂		Fort Leavenworth....	Jan. 26, 1855	Lt. D. N. Couch....		Skin....		10.50				2.40		
1497		♀		Mouth of Platte....		Lt. G. K. Warren....		do....								
2403	3148			Red Fork of Arkansas	July 1, 1850	Dr. S. W. Woodhouse.		Mounted....								
1121				Ft. Des Moines, Iowa.	Dec., 1855	W. E. Moore....		Dry skin....		11.25	9.00	11.50		2.70		
1228 ^a		♂		do....	Summer, '55	do....		do....		11.00	7.00	10.50		2.70		
1127 ^a		♀		do....	do....	do....		do....		10.50	8.00	11.00		2.45		
1128 ^a		♀		do....	do....	do....		do....						2.65		
1130 ^a				do....	Dec., 1855	do....		do....		11.50	7.00	9.50		2.70		
1131 ^a				do....		do....		do....		11.00				2.80		
1132 ^a		♂		do....		do....		do....								
1133 ^a				do....		do....		do....								
1134 ^a	3146			do....		do....		do....		11.00				2.50		1.35
1135 ^a				do....		do....		do....		10.50				2.65		
1153				Wisconsin....		A. C. Barry....		Skin in alc.								
722		♀		West Northfield, Ill.		R. Kennicott....		Dry skin....		11.00				2.70		
723				do....		do....		do....								
726				do....		do....		do....								
727				do....		do....		do....						2.70		
183		♀		Detroit, Mich....	August, 1853	C. Fox....		do....						2.60		
180				Cleveland, Ohio....		Dr. Kirtland....		do....								
182				do....		do....		do....								
956				Middleboro', Mass....	Oct. 27, 1855	J. W. P. Jenks....		do....								
1437				do....	Spring	do....		do....								
2176				New York....		do....		Skull....							2.60	1.40

^a Hairs on the throat annulated; ears with white tufts.^b Ears with white tufts.^c Ears without white tufts.

List of Specimens. (Black and dusky squirrels, or not pure white beneath.)

Catalogue number.	Corresponding No. of skull.	No. of specimen.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.						
									Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore feet.	Length of hind feet.	Length of skull.	Width of skull.
127				Racine, Wisconsin.....	.....	Dr. Hoy.....	.....	Dry skin...	11.00	7.00	10.00	.....	2.40	.....	.....
98				do.....	.....	.....do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....
1250				do.....	.....	.....do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....
1251				do.....	.....	A. C. Barry.....	.....	.....do.....	.....	.....	.....	.....	.....	2.40	1.35
1252				do.....	.....	.....do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....
1208				do.....	July, 1853	S. F. Baird.....	.....	.....do.....	10.00	8.25	11.00	.....	2.65	2.60	1.41
1209				do.....	.....	.....do.....	.....	.....do.....	10.00	7.50	10.00	.....	.....	.....	.....
1853				do.....	.....	Dr. Hoy.....	.....	Mounted ..	.....	.....	.....	.....	.....	.....	.....
1249				do.....	.....	.....do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....
115				Wisconsin .....	.....	A. C. Barry.....	.....	Skin in alc.	.....	.....	.....	.....	2.50	.....	.....
113			♂	Fort Des Moines, Iowa.	Summer.....	W. E. Moore.....	.....	Dry skin...	9.50	.....	.....	.....	2.50	.....	.....
97			♂	West Northfield, Illinois	Sept., 1855	R. Kennicott .....	.....	do.....	10.25	8.00	11.00	.....	2.65	.....	.....
105				do.....	Nov., 1855	do.....	.....	.....	8.00	7.00	10.00	.....	2.40	.....	.....
72				do.....	Winter, 1855	do.....	.....	.....	10.25	9.25	12.25	.....	2.60	.....	.....
72				do.....	Spring, 1855	do.....	.....	.....	10.50	9.00	12.50	.....	2.75	.....	.....
72				do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
72				do.....	.....	.....do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
97			♂	do.....	Sept., 1855	do.....	.....	.....	10.00	8.00	11.00	.....	2.50	.....	.....
17			♂	Detroit, Michigan.....	Dec. 8, 1852	C. Fox .....	.....	Dry skin...	11.00	9.00	11.00	.....	2.55	.....	.....
17				do.....	.....	.....do.....	.....	Dry (head).....	.....	.....	.....	.....	.....	.....	.....
18				Cleveland, Ohio .....	.....	Dr. Kirtland.....	.....	Dry skin...	10.00	9.50	12.00	.....	2.50	.....	.....
238				Bradford county, Pa....	.....	C. C. Martin.....	.....	Skin in alc.	9.50	.....	.....	.....	1.95	.....	.....
60				Cleveland, Ohio .....	.....	Dr. Kirtland.....	.....	Skull.....	.....	.....	.....	.....	.....	2.50	1.39

1 Uniformly black all over, with white tuft at the end of the tail.

2 Uniformly black all over, without white tuft.

3 Uniformly black above; annulated dusky beneath.

4 Nearly uniform black, but with some annuli above and below.

5 Dusky all over, and considerably annulated.

6 Grayish above; annulated with rusty beneath in places.

SCIURUS CAROLINENSIS??

Mexican Gray Squirrel.

have before me two skins of gray squirrels from Santa Catarina, in Mexico, which differ appreciably from any I have seen from within the United States. They are smaller than the southern gray, with longer and perhaps more bushy tail, and shorter and broader feet. The hair is coarser; above, more decidedly black and gray; beneath, very pure white, without any indication of the rusty line margining the white of the belly, which I have never found wanting before. The hairs of the tail are coarser; the exterior white, very opaque, and of a yellowish tinge, instead of the bluish white of the common gray. The ears show no trace whatever of white on their convexity.

Although this locality is very different from the usually recorded range of the gray squirrel, and the differences of these specimens are quite appreciable, I do not feel at liberty to establish them as distinct species, without further materials.

The skull of this species presents some quite striking characteristics. In the first place, the small anterior upper molar, so universal in the gray squirrel, is here wanting entirely, as in the fox squirrels. The zygoma extends further backward, though the muzzle is shorter and

broader. The nasal bones have their edges nearly parallel for the posterior third, instead of approaching each other gently behind. The teeth are smaller in proportion.

One skull, one of three from San Antonio, shows the anterior small molar. This may be the same, or it may belong to a distinct species. It measures 2.33 inches by 1.38.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.			Collected by—
							Nose to occiput.	Nose to root of tail.	Hind foot.	
337	.....	Santa Catarina, New Leon, (Northern Mexico)	April, 1853	Lt.D.N.Couch,U.S.A.	177	Skin	2.50	10.00	2.40	.....
336	1254	do.....	do.....	do.....	.....	Mounted ..	.....	.....	2.40	.....
? 1420	.....	San Antonio, Texas.....	.....	.....do.....	.....	Skull .....	.....	.....	.....	Dr. L. Berlandier.
1421	.....	.....do.....	.....	.....do.....	.....	.....do.....	.....	.....	.....	.....do.....

SCIURUS FOSSOR, Peale.

California Gray Squirrel.

Sciurus fossor, PEALE, Mamm. and Birds U. S. Ex. Ex. 1848, 55.

AUD. & BACH. N. Am. Quad. III, 1854, 264; pl. cliii, f. 2.

Sciurus heermanni, LECONTE, Pr. A. N. Sc. Phila. VI, Sept. 1852, 149.

??? *Sciurus leporinus*, AUD. & BACH., Pr. A. N. Sc. Ph. 1841, 101.—IB. Jour. A. N. Sc. Ph. VIII, II, 1842, 314.—IB. N. Am. Quad. I, 1849, 329; pl. xliii.

SP. CH.—Size of *S. vulpinus*, but more slender. Tail vertebræ as long as the body, with the hairs much longer. Five upper molars. Above, grizzled bluish gray and black; beneath, white, without any differently colored separating line. Tail black, with the exterior white; the whole under surface finely grizzled. Back of ears and adjacent tuft on the occiput, chestnut.

This beautiful species of squirrel is among the largest of those that inhabit the North American continent, and on the west coast represents the gray squirrels of the Atlantic States. Judging from skins, however, it is rather more slender and delicate in its proportions than the latter.

The head is rather pointed and narrow; the whiskers black and reaching beyond the occiput. The ears are thin, narrow, and high, somewhat pointed, but rounded at tip; they are coated with short compact hairs, not at all tufted; as in the *S. carolinensis*, however, there is a woolly tuft at the postero-internal base of the ear, the adjacent region of the latter also somewhat woolly.

The tail is very long, and rather full and depressed; in fresh specimens the vertebræ alone equal the head and body. The hairs are long and rather soft. The feet are long but narrow; the soles are nearly naked in summer; in winter they are densely coated (especially in the north) with hairs, except on the tubercles. Even at San Diego, winter specimens exhibit a considerable amount of hair on the soles.

This species presents fewer variations in color than any of the larger American squirrels within my knowledge. The prevailing color above is a mixed or finely grizzled bluish gray and black, the former predominating. This color covers nearly two-thirds, at least three-fifths,

of the circumference, the entire under parts being pure white. There is not the slightest trace of any darker line of separation on the flanks. The upper surface of the feet and exterior of the limbs are like the back; the paws perhaps lighter, but still grizzled. The inner edge of the hind foot, also, is nearly uniform dull whitish. The lower parts of the cheeks and side of the muzzle are greyish white, less pure than on the belly. The woolly tuft at the base of the ear, and usually the convexity or back of the ear itself, are light chestnut, forming a very conspicuous feature.

The tail is a mixed gray, black and white. Beneath, it is grizzled; above, black predominates, with some white on the outside; on the side the white is very conspicuous, forming a distinct white border. The inferior hairs are grayish white, with four or five annulations of black, about the width of their interspaces. The same condition prevails pretty much on the rest of the tail, with the exception that the subterminal annulation is much broader and entirely black, and on the sides the terminal white is also very long.

There is no appreciable difference in a number of specimens of this squirrel before me from different localities; much less than usual in squirrels. One from Fort Tejon has a smaller body in proportion to its tail than the rest; but the skin has probably shrunk considerably in alcohol, and the animal itself was quite young, as shown by the skull. This is the only one in which there is no chestnut on or behind the ear, the woolly tuft there being dirty whitish. One specimen (609) shows a slight wash of rusty on the back, and the hind feet are sooty black, slightly grizzled. This is the most decided variation I have noticed. Winter specimens have the soles hairy, except on the tubercles, while summer ones have them naked.

Skull.—The skull of this species appears rather more slender and elongated than that of the *S. carolinensis* or the fox squirrel of the Mississippi; its closest relationships, as to shape, are with the *S. vulpinus*, which it nearly equals in size. It has, however, a longer muzzle and the zygomatic arch set further back. An old skull has four distinct upper molars and the stumps of the anterior fifth one, broken down to the level of the socket. In several younger ones this small molar is well developed and considerably larger than in *S. carolinensis*, the crown having a compressed central tubercle and a distinct valley on either side.

This species is mentioned by Lewis & Clark, under the name of "the large gray squirrel," as occurring near the Dalles of the Columbia, and they fully appreciated its difference from the squirrels of the eastern States. It is a little singular that an animal described with such detail by these authors should not have been named by the earlier writers, like Ord, Rafinesque, Harlan, and others, when all the other species mentioned in the narrative of the expedition were so promptly introduced into the systems.

I am not without a strong suspicion that the *Sciurus leporinus* of Audubon and Bachman may prove to be the same with the *S. fessor*, in which case it will, of course, take precedence. The only point in the description which cannot be readily referred to *S. fessor* of Peale is in the color of the back, which is said to closely resemble that of the English hare (probably *Lepus timidus*) in its brown tints. But for this I would be inclined to consider it as a young specimen of *S. fessor*, as in the most immature one I have seen (480) the downy space on the back and base of the ear was whitish instead of chestnut. Indeed, this same specimen I had unhesitatingly labelled *S. leporinus* before the opportunity was afforded of examining adult animals.

This squirrel inhabits abundantly the whole mountain region of California, from San Diego as far north as the Columbia River at the Dalles; it does not appear to cross this river. The extreme limit of its distribution south and east is not yet ascertained. As far as I can learn, however, it is the only large species found within the region inhabited by it; and I have no

doubt whatever that, with very few exceptions, the many species described by Audubon and Bachman as from California are really from Southern Mexico, adjacent, perhaps, to southern California, and have no right to a place in a fauna of North America, certainly not of the United States.

Detailed measurements of a specimen in alcohol.

Current number.	Sex.	Locality.	Tip of nose to—				Tail to end of—		Length of—	
			Eye.	Ear.	Occip.	Tail.	Vert.	Hairs.	Fore ft.	Hind ft.
2413	○	Petaluma, Cal.....	1.35	2.45	2.8	11.25	11.5	14.75	2.	3.1

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.			Collected by—
								Head and body.	Tail.		
									Vert.	Hairs.	
1002	.....	♂	Fort Dalles, O. T.....	Jan. 17, 1855.	Dr. Geo. Suckley.....	36	Skin .....	.....	12.50	15.50	.....
1003	2010	♂	do.....	Jan. 15, 1855.	do.....	37	do.....	11.25	10.60	14.00	.....
1004	2011	♂	do.....	Jan. 15, 1855.	do.....	38	do.....	11.50	11.00	14.25	.....
1175	.....	.....	Fort Jones, Cal.....	1855.	Lt. R. S. Williamson.....	.....	do.....	.....	.....	.....	Dr. J. S. Newberry.
1173	2117	.....	Stockton, Cal.....	.....	.....do.....	.....	do.....	.....	.....	.....	.....do.....
2413	.....	♂	Petaluma, Cal.....	.....	E. Samuels.....	214	Entire in alc'h'l.	.....	.....	.....	.....
609	.....	.....	San Francisco, Cal.....	.....	R. D. Outts.....	.....	Skin .....	.....	.....	.....	.....
2463	.....	.....	.....do.....	.....	Lt. W. P. Trowbridge..	.....	do.....	.....	.....	.....	.....
1174	.....	.....	.....do.....	.....	Lt. R. S. Williamson..	.....	do.....	.....	.....	.....	Dr. J. S. Newberry.
480	1604	.....	Fort Tejon, Cal...	.....	.....do.....	.....	Mounted .....	.....	.....	.....	Dr. A. L. Heermann.
2462	.....	.....	San Diego, Cal.....	.....	Dr. Thomas H. Webb..	.....	Skin .....	.....	.....	.....	.....

SCIURUS CASTANONOTUS, Baird.

Chestnut Backed Squirrel.

Sciurus castanotus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 332. (Typographical error for *castanonotus*.)

Body about 11 inches. Tail, with the hairs, but little longer. Hind feet 2.60 inches, skull, 2.40.

Size about that of *S. cinereus*. Five permanent molars in the upper jaw. Tail about equal in length to the body, not bushy. Ears with rather short hairs, not tufted. Soles naked in winter. Back deep chestnut brown; rest of upper parts mixed ash, gray, and lead color. Eyelids, upper surfaces of feet, and whole under parts white. Ears and sides of head ash gray. The sides, tip, and under parts of tail, pure white; above (within the margin) mixed black and white.

A detailed description of this squirrel will be found in the report of the Zoology of the United States and Mexican Boundary Survey.

This species bears a very close resemblance to *S. aberti* and may prove to be the same, although there are abundant differences. The most striking characteristic is the absence of the beautiful ear tufts of *S. aberti*. Some of our squirrels which have smooth ears in summer are tufted in winter, but as the Coppermines specimens were caught in winter, it is not likely that they are ever tufted. The tufts, too, of *S. aberti* are long hairs growing from the very margins of the ears and projecting an inch beyond. The convexity of the ear and a woolly space at their

posterior bases are grayish white in *S. castanonotus*. Great differences again are visible in the tail, which, in the latter, is nearly pure black and white; the inferior hairs pure white, those on the upper surface and upper part of the sides are black with white tips, grayish at the base. In *S. aberti* all the hairs above are annulated several times with dark brown and grayish white, presenting no decided impression of either color except towards the end of the tail. The tail here is likewise much more bushy.

S. fossor is without the dorsal stripe and the dark lateral line. The tail is much fuller and more bushy; the hairs beneath the tail are finely annulated ash gray and black without any of them being entirely white. The feet, also, are dark colored.

The skull of this species is of very nearly the same size with that of *S. carolinensis*, from Carlisle, Pennsylvania. Like this species it has the anterior small upper molar, making five; but this is considerably larger in the New Mexican animal, and has a central tubercle on the crown, with a lateral valley on either side, as in the spermophiles. There are no other differences of importance.

The name of *castanonotus*, as originally published, was a typographical error, not detected until too late, and conveys an erroneous impression in regard to the color of the ears.

List of specimens.

Catalog'g number.	Correspond'g No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specim'n.	Collected by—
121	1107	♀	Coppermines, N. M.-----	Winter, 1852	Col. J. D. Graham	Skin ---	J. H. Clark -----
122	1108	-----	-----do-----	-----do-----	-----do-----	do-----	-----

SCIURUS ABERTI, Woodhouse.

Tuft Eared Squirrel.

Sciurus dorsalis, WOODHOUSE, Pr. A. N. Sc. Phil. VI, June, 1852, 110. (San Francisco Mountains, Cal.)

Sciurus aberti, WOODHOUSE, Pr. A. N. Sc. Phil. VI, Dec. 1852, 220.—In. Sitgreaves' Zuffi Exped. 1853, 53; mammals, pl. vi.

AUD. and BACH. N. Am. Quad. III, 1854, 262; pl. cliii. fig. 1.

ST. CH.—Above finely grizzled bluish gray and black; a broad dorsal stripe of pure chestnut from shoulders to tail; under parts and feet white; a distinct dark line on each side the belly. Tail very full and bushy, as long as the body; pure white beneath, above mixed black and white. Ears with long tufts springing from the superior border of the ear, as in *Sciurus vulgaris*. Head and body about 11 inches long.

This is one of the handsomest of all the American squirrels, on account of its large size, full and long tail, and tufted ears. It has hitherto been found only in the San Francisco mountains of New Mexico, from which the specimen I have before me was brought by Dr. Woodhouse. Many hundred specimens of this species were observed in the same range by Dr. Kennerly, all of them conspicuous for their tufted ears.

This squirrel is about the size of the western fox squirrel, although it exceeds it in the comparative length and fullness of the tail. The ears are high and narrow, and remarkable for the flattened tuft of hairs which crown the superior half of the ear, springing from the extreme margin, or on the upper part of the convexity: the posterior margin of the ear is also tufted to

a slight degree; all the hairs, however, directed upwards, and forming a flattened pencil as long as the height of the ear. There is nothing of the woolly basal tufting of the eastern gray and fox-colored squirrels. The fur on the body is full and soft.

The upper parts (about half the circumference of the body) with the sides of shoulders and thighs are of a finely grizzled bluish gray; the hairs annulated subterminally with black, and tipped with a lighter shade than that at their bases. On the middle of the back is a distinct stripe of rich chestnut brown, about an inch wide, commencing at the shoulders (where, however, it is illy defined) and extends to the root of the tail, (which it does not invade, however.) The under parts with the feet are white; the colors of the belly and sides separated on the flanks by a distinct stripe of plumbeous black, about half an inch wide. The sides of the head are gray, the under surface is like the belly. The pencil of hairs on the ears is glossy black, tinged with chestnut at the base; the posterior hairs are almost entirely rich chestnut.

The under surface, or under half of the tail, is pure white, the hairs without any annulation whatever except near the body; the hairs on the upper half are brownish white, with a basal and three other annulations of dark brown. The subterminal annulation, however, is broadest and black; the ends of the hairs pure white.

In the report of the Zoology of the Mexican Boundary Survey, I have described a *Sciurus castanonotus*, from the Coppermines of New Mexico, which, though similar in many respects, yet presents tangible differences. The most conspicuous is the entire absence of any indication of tufts. I am assured that these conditions are constant, all of the specimens in the San Francisco mountains exhibiting them and none of those at the Coppermines. The tail is less bushy; the upper hairs entirely black with white tips, or else white with a single median annulation of black. The wash of chestnut on the back is much broader, the lateral stripe less distinct.

All these differences may, however, after all, be merely seasonal, or dependent on other causes, (although all the specimens in question were collected in winter,) and with a better knowledge of the American species of squirrels now than when I first characterized the *S. castanonotus* (in 1855) I would hardly venture to impose a new name. As this has been done I retain it, and wait further evidence to verify or disprove what I have done.

This species was first described by Dr. Woodhouse as *S. dorsalis*, but finding the name preoccupied by J. E. Gray for a species from Caraccas, (Pr. Zool. Soc. Lond. XVI, 1848, 138,) he changed it to the one it so worthily bears, of the liberal and enlightened head of the Topographical Bureau, Colonel J. J. Abert.

List of specimens.

Catalogue number.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Measurements.									Collected by—
					Nose to—		Tail to end of—		Length of—		Height of ear anteriorly.	Height above notch.	Projection of tuft.	
					Occip.	Tail.	Verteb.	Hairs	Fore ft.	Hind ft.				
2430	San Francisco mts., N. M.	Winter.	Capt. L. Sitgreaves, U. S. A.	Mounted.	2.80	11.00	8.	12.	1.75	2.70	1.05	1.42	1.10	Dr. S. W. Woodhouse.

SCIURUS HUDSONIUS.

Red or Pine Squirrel.

- Sciurus hudsonius*, PALLAS, Nov. Sp. Glirium, 1778, 376.
 BODDAERT, Elenchus Animal. I, 1784, 118. (From Pennant.)
 ZIMMERMANN, in Penn. Arktische Zoologie, I, 1787, 115.
 SCHREBER, Säugthiere, IV, 1792, 777; tab. ccxiv. (*Labradorische Eichhorn*, in the text.)
 SHAW, Gen. Zool. II, 1801, 140.
 KÜHL, Beiträge, 1820, 66.
 DESMAREST, Mammalogie, II, 1822, 340.
 JOS. SABINE, Zool. App. Frankl. Narr. 1823, 663.
 HARLAN, Fauna Americana, 1825, 185.
 FISCHER, Synopsis, 1829, 349.
 GODMAN, Am. Nat. History, II, 138.
 RICHARDSON, Fauna Boreali-Americana, I, 1829, 187; pl. xvii.
 GAPPER, Zool. Journal, V, 1830, 205.
 F. CUVIER, Suppl. Buffon, I, Mamm. 1831, 303.
 BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 100.—*Id.* Charlesworth's Mag. N. H. III, 1839, 383.
 DEKAY, New York Zool. I, 1842, 61; pl. xvii, fig. 2.
 WAGNER, Suppl. Schreber, III, 1843, 178.
 AUD. & BACH, N. Am. Quad. I, 1849, 125; pl. xiv.
 KENNICOTT, Pat. Off. Rep. 1856, Agricultural, (1857,) 67; pl. vii.
Sciurus carolinus, ORD, Guthrie's Geog. (2d Am. ed.) II, 1815, 292. (*Carolina or chickaree squirrel*.)
Sciurus rubrolineatus, DESMAREST, Mamm. II, 1822, 333. (From Warden's Hist. U. S.)
Tamias rubrolineatus, SCHINZ, Syn. Mamm. II, 1843, 48.
Hudson's Bay squirrel, PENNANT, Synopsis Quad., 1771, 280.
Hudson squirrel, PENNANT, Hist. Quad. 1781, No. 274.—*Id.* Arctic Zool. I, 1782, 116. (Specimen in Leverian Museum.)

SP. CH.—Body seven to eight inches long—longer than the tail. Ears moderate, broad, coated with long hairs springing from the back and projecting beyond in a tuft. Tail narrow, flat. Hind feet densely hairy to the tubercles at the base of the toes, the under surfaces of which are themselves somewhat coated; in summer somewhat naked. Above and on the sides mixed black and grayish rusty. A broad wash of bright ferruginous down the back and upper surface of the tail. Lower surface of the body dull white; hairs not annulated, except in very northern specimens. Tail rusty on the margin, within which is a narrow band of black, both colors greater in extent at its end. Hairs above uniform ferruginous, not annulated; beneath annulated like the sides.

Although not collected by any of the expeditions, I have thought proper to give a description of this species, to serve as a standard of comparison with several others closely allied to it in subgeneric as well as specific characters. How far west its range extends cannot at present be determined, none having as yet been received by the Smithsonian Institution beyond Wisconsin. It is found throughout the Atlantic States, as far north at least as Labrador, and to the Mississippi river. As expressing probably the average of the species, I have selected for description a specimen from Cleveland, Ohio, presented by Prof. J. P. Kirtland.

Body about eight inches in length, stout. Head rather short and broad. Whiskers black, much longer than the head, extending back to the axillæ. Numerous long whisker-like hairs projecting beyond the shorter fur on the fore limbs. Extreme end of nose hairy, the septum only being naked. Ears broad, rounded; their convexity quite thickly coated with long hairs, completely concealing it from view on that side. Some of these hairs project beyond the margin more than half an inch, the longest being towards the tip. The concavity of the ear is coated with short hairs. The two middle fingers are equal in length. The inner or second reaches to the base of the claw of the one next to it, and is a little longer than the outer. The palms are naked. On the hind foot, the third and fourth toes are equal; the second a little shorter; the first or inner shorter than the fifth or exterior, which scarcely reaches to the base of the

claw of the fourth. The under part of the foot, from the heel nearly to the base of the toes, or to the callosities, is densely coated with short grayish hairs; and the sides of the toes being similarly coated, the ends of the hairs here project beyond so as almost to cover the inferior surfaces, which, in fact, are actually provided with scattered hairs.

The tail with its hairs is rather shorter than the body. It is much flattened, as in *Pteromys*, but narrow, scarcely exceeding an inch and a half in a natural expansion.

The prevailing color of the upper parts and sides and the under surface of the tail is a yellowish rusty, mixed with black by the fine annulations on the distal third of the hairs, their basal portion being dark lead color. The dorsal surface, however, for about the width of the tail, as well as the upper surface of the tail itself, are washed with dark ferruginous. This color is seen, likewise, on the top of the head. The sides of the head are mixed gray, a ring around the eye, and the whole under parts dull silvery white. In some specimens the hairs on the latter surface are unicolored to the roots, which, in others, are lead colored. The colors of the belly and sides are separated by a dusky stripe. The tail, as stated, is ferruginous above, grayer beneath. It is margined all around by pale yellowish red, darker at the tip. Within this is a narrow border of black, of greatest extent at the tip. The single hairs at the end of the tail are brown at base, then ferruginous, then black and tipped with ferruginous; on the sides they are similar, but the tints lighter; beneath, they are mixed brown and pale yellowish brown; above, they are nearly uniform ferruginous, with little, if any, annulation—a character seldom seen in squirrels.

Measurements of a dried skin, No. 184.

	Inches.	Lines.
Length to root of tail.....	7	6
Tail to end of vertebræ.....	4	6
Tail to end of hairs.....	7	3
Height of ears.....		5
Hind foot from heel.....	1	11

Measurements of specimens in alcohol.

Number.	Locality.	From tip of nose to—				Tail to end of—		Length of—	
		Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.
2427	Carlisle	.8	1.50	2.00	7.25	5.00	6.50	1.20	1.80
2428	do.....	.8	1.50	1.85	7.00	5.00	6.25	1.10	1.75
2429	Monticello, Mississippi	.8	1.50	1.85	6.25	3.50	4.25	.80	1.30

Specimens vary from this description in the less intensity of ferruginous above; in a greater amount of grayish on the sides; in the ferruginous of the dorsal region being narrower and more concentrated. I have occasionally seen specimens in which the upper parts were nearly uniform gray and black, the former with the slightest possible mixture of rusty.

The *Sciurus hudsonius* is thus a very strongly marked species, and is readily distinguished from any hitherto described by the various characters assigned.

The amount of hair on the soles depends very much upon the latitude and season. The specimen described at length above is a winter one. In summer the sole is hairy posteriorly for about half the distance from the heel to the tips of the toes; the region immediately behind the tubercles at the bases of the digits being naked. The isolated posterior tubercle of all towards the heel is also nearly naked, though coated with hair in winter.

The tufting of the ears seems to vary in quite a similar manner, in some summer specimens the tufts being entirely wanting.

The black line on the flanks, reaching from fore to hind legs, is quite variable in its appearance, being in most specimens wanting entirely, in others very faintly indicated. As stated, the amount of rusty chestnut varies greatly, sometimes diffused over the whole back, sometimes forming a broad or narrow dorsal stripe, in which the hairs are not at all annulated, and again quite inconspicuous. The upper part of the tail, however, always seems to retain its bright light chestnut or rusty, without annulation.

Specimens from Halifax and Labrador present a very interesting difference from more southern skins in the much grayer cast of the under parts, the hairs at the same time appreciably annulated into black at tip, or subterminally. The fur is fuller, the tail well provided with under fur, giving a slight resemblance to that of the *S. vulgaris*, though it is not so cylindrical. These characters are indicated by Pennant, in his original description of the species from Labrador specimens.

Specimens from Mississippi have the ear covered with short hairs; the soles hairy to within a short distance of the digital tubercles.

List of specimens.

Catalogue number.	Corresponding No. of skulls.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
2367	-----	-----	Labrador, latitude 56°	-----	Dr. J. B. Gilpin	Skin
2368	-----	-----	do	-----	do	do
2052	-----	-----	Halifax, N. S.	-----	do	do
2366	-----	-----	do	-----	do	do
16	-----	-----	Montreal	-----	T. Broome	do
1561	2394	-----	Essex county, N. Y.	-----	Dr. S. E. Hale	-----
843	1904	♀	do	Aug. 14, 1855	S. F. Baird	-----
850	-----	-----	-----	Sept. 6, 1855	D. Welsh	-----
187	-----	-----	Detroit, Mich.	October, 1852	C. Fox	-----
186	-----	♂	do	Mar. 10, 1853	do	-----
98	-----	♂	do	May 8, 1852	do	-----
335	1253	-----	Racine, Wis.	-----	A. C. Barry	Mounted
184-5	-----	-----	Cleveland, Ohio	-----	Dr. J. P. Kirtland	Skin
2464	-----	-----	Meadville, Pa.	-----	J. F. Thickstun	In alcohol
2443-4	-----	-----	Mount Joy, Pa.	-----	J. Stauffer	Skin
1673	2495	-----	Carlisle, Pa.	-----	S. F. Baird	do
2427	-----	♀	do	-----	do	In alcohol
2428	-----	♀	do	-----	do	do
2429	-----	♂	Monticello, Miss.	-----	Miss Teunison	do

SCIURUS FREMONTII, Towns.

Small Mountain Gray Squirrel.

Sciurus fremontii, ("Townsend,") Aud. & Bach. N. Am. Quad. III, 1853, 237; pl. cvlix, fig. 1.

About the size of the Hudson's Bay squirrel, *S. hudsonius*. Tail shorter than the body. Ears tufted in winter, but not in summer. Above mixed brown, gray, and pale rusty, the prevalent tint similar to that of the gray squirrel; beneath bluish white; a dark line along the sides. Eyelids white. Tail entirely black at end, the hairs tipped with light gray; on other parts of the tail a mixture of plumbeous and grayish rusty at the base of the hairs. No rusty visible externally.

The general appearance of this animal is that of the chickaree or red squirrel, (*Sciurus hudsonius*), which it resembles in size. The whiskers are moderate in length, not reaching much beyond the ears. The ears are large, the exposed portion of the concavity densely coated with hair; the inner or convex surface still more, but with no appearance of tufts in summer whatever—not nearly so much as in *S. hudsonius*. In the winter specimen described by Audubon and Bachman, however, the ears are very strongly tufted.

On the fore foot the first finger or thumb is rudimentary, being a mere tubercle, without any claw; the second, third, and fourth increase successively; the fourth is longest (the claw of the second not reaching to the base of its claws;) the fifth, or outer, is barely shorter than the second. The palm is naked. On the hind feet, the first toe is a little shorter than the fifth; the second, third, and fourth nearly equal. The sole is naked from the tarsus; probably hairy in winter.

The tail is of moderate length; flattened, not bushy, and rather shorter than the body.

The whole upper parts and sides are finely mottled by the narrow annulation of the hairs with gray, black, and light reddish brown, none of these colors predominating, though the general tint is faintly darker along the back. About the head there is an additional shade of dark bluish ash. Eyelids white; sides of the snout rusty white; whole under parts clear bluish white. The exterior surfaces of the limbs are pale rusty. The separation of the colors of the belly and sides, between the fore and hind limbs, is clearly marked by a dark line about one-fourth of an inch wide. The hairs on the body are all lead color for about half their length; those above are narrowly annulated besides with pale rusty and black, with light tips.

The hairs on the end of the tail are entirely of a glossy black, except a light tip of grayish; towards the root of the tail they become more plumbeous at the base, then pale rusty brown, black and grayish white.

This species appears to differ from most of the small true squirrels in the nearly black and white tail, the tip being black.

The specimen described by Audubon is in winter dress, with long ear tufts; the present is in summer.

There are few well defined species of North American squirrels of which we know so little as the subject of the present article. The specimen described by Audubon and Bachman was collected in 1849 by Colonel Frémont somewhere in the vicinity of the South Pass, and is now in the Museum of the Philadelphia Academy of Natural Sciences. The one brought home by Captain Beckwith was found in the Sawatch Pass, and the two are all that as yet have come to the notice of naturalists.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Original number.	Nature of specimen.	To root of tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Collected by—
520	Sawatch Pass, Rocky Mountains..	Capt. E. G. Beckwith	18	Skin.....	8.00	5.00	6.50	1.05	Mr. Kreutzfeldt.

SCIURUS RICHARDSONII, Bach.

Richardson's Squirrel.

Sciurus richardsonii, BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 100.—IB. Charlesworth's Mag. N. H. III, Aug. 1839, 385.—IB. Jour. Ac. N. Sc. Phil. VIII, 1, 1839, 64 —IB. Townsend's Narrative, 1839, 318.
AUD. & BACH. N. Am. Quad. I, 1849, 41; pl. v.

Sciurus hudsonius, var. β , RICH. F. BOR. Am. I, 1829, 190.

? *Sciurus lanuginosus*, BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 101.—IB. Charlesworth's Mag. N. H. III, Aug. 1839, 387.—IB. Jour. A. N. Sc. Phila. VIII, 1, 1839, 67.—IB. Townsend's Narr. 1839, 320.

WAGNER, Suppl. Schreb. III, 1843, 180.

AUD. & BACH. N. Am. Quad. I, 1849, 199; pl. xxv.

SP. CH.—Size larger than the Hudson's Bay squirrel. Ears with long hairs, presenting the appearance of tufts. Tail shorter than the body. Under surface of feet hairy from heel to metatarsals; then nearly naked. Above, reddish brown, varied with annulations of black, lighter on the sides; beneath, dull white; a dark line separating colors of sides from belly. Tail bushy, sub-cylindrical, dark reddish brown in the centre, entirely of a pure glossy black at tip. The hairs all long and coarse. Hairs on the tail generally, (except at tip,) glossy black beyond the rufous portion, and more or less tipped with paler rusty.

General appearance that of *S. hudsonius*, or the chickaree, although larger. Whiskers longer than the head, black. Ears large, rather sparsely clothed on their back with long hairs, which at the base are four lines long, and but little shorter towards the tip; the ends of the hairs, projecting beyond the margins of the ears, present the appearance of tufts; on the concavity of the ear the hairs are very short.

The limbs are moderately developed; the thumb a mere callosity; the fourth finger longest; third scarcely shorter; the second and fifth nearly equal. The claws are much as in *S. hudsonius*; the palms are naked; the hind foot from the heel is shorter than in the other species; the fourth toe is longest; the third and second successively and slightly shorter; the fifth comes to the base of the claw of the fourth; the first reaches to the base of the claw of the fifth; the under surface of the foot, from heel to metatarsals, is densely clothed with hair, the soles naked or with a few scattered hairs under the toes. Claws smaller than in *S. hudsonius*. Tail shorter than the body, little flattened, hairs at the extremity very long.

The prevailing tint of the upper parts is dull rusty or reddish brown; the hairs being lead color at the base, then annulated with black and dark chestnut brown. In some specimens this tint is diffused over the whole back, in others more confined to the dorsal region; along the sides of the body the ferruginous is a good deal lighter, imparting a grayish tint. The outer surfaces of fore legs and of hind foot are brighter ferruginous, paler on the latter. The under parts are of a dull brownish, or very pale rusty white; and there is a distinct line of dusky on the flanks, separating the upper and under color. In some specimens the lower edge

of this line is tinged with rusty. There is a light ring around the eye, and the sides of the nose are of a pale rusty.

The hairs of the tail are long and coarse, scarcely distichous. At the extremity of the tail they are glossy black throughout, or with a slight base of chestnut; on the rest of the tail above they are dark plumbeous at the base, then dark chestnut to beyond the middle; then glossy black to near the tip, which is pale rusty, the latter increasing in extent towards the base of the tail. Beneath, the hairs are several times annulated with black and pale rusty for more than half their length; then glossy black to near the tip.

According to Dr. Bachman it would appear that *S. richardsonii* is about the size of the striped squirrel, (*Tamias striatus*), has less of reddish brown than in *S. hudsonius*, being even rusty gray. These specimens, on the contrary, are larger than *S. hudsonius*, and the upper parts are deeper reddish brown than in this species. They agree in the colors of the under parts and the dark line on the sides, as well as in the peculiar color of the tail. The feet appear smaller too. The description of the "small brown squirrel" of Lewis and Clark, referred to as belonging to this species, suits better *S. douglassii*, especially in respect to the ferruginous belly.¹

This squirrel appears to be confined to the region between the main chain of the Rocky Mountains and the Cascade range. Its northern and southern limits are not ascertained.

The *Sciurus lanuginosus* of Bachman, as far as I can judge from examining the original specimen brought by Townsend, is a partly albino and boreal variety of *Sciurus richardsonii*. It is of the same size, and the tail presents the same peculiarly cylindrical tail. The fur is very soft and full, the sole, from heel to bases of toes, densely hairy. The muzzle, sides of face, and under parts are white; the sides mottled silver gray; the back with a wash of rufous. There is no distinct annulation on the tail, though the hairs generally are light gray at the roots, then broadly pale rufous, then dark brown, and finally tipped with lighter brown or gray.

There is nothing in the color to militate against the supposition that this is the same with *S. richardsonii*, and the white head and lighter colors generally furnish strong confirmation of the idea that the color has been influenced by temperature, latitude, or other causes. As is well known, North America has no species in which a head lighter than the body is a permanent characteristic. The peculiarly cylindrical tail is a strong point in the resemblance. It is barely possible that it may more properly be referrible to *S. douglassii*.

The specimen is described by Bachman as coming from Sitka; it is, however, labelled "Columbia river, November 13, 1834," most probably erroneously.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specim'n.	Collected by—
214 ²	1185	St. Mary's Mis'n, R. Mts.	Oct. 1, 1853	Gov. I. I. Stevens.	3	Skin ...	Dr. G. Suckley ..
215	-----	-----do-----	-----do-----	-----do-----	-----	-----do-----	-----do-----
213	1184	Rocky Mountains	-----	-----do-----	-----	-----do-----	-----do-----
216	-----	-----do-----	-----	-----do-----	-----	-----do-----	-----do-----
217	-----	Spokane Plain, W. T.---	Oct. 30, 1853	-----do-----	10	-----	Dr. J. G. Cooper.

¹ Since writing this description I have examined the original specimen collected by Townsend and described by Dr. Bachman, now in the collection of the Philadelphia Academy. It is undoubtedly a quite immature animal, of the same species with the subject of the present article.

² Length, 9.00; tail, vertebrae, 6.00; hairs, 8.00; ear, 0.50; hind foot, 1.83.

SCIURUS DOUGLASSII, Bach.

Oregon Red Squirrel.

Sciurus douglassii, ("GRAY,")¹ BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 99.—IB. Jour. Acad. Nat. Sc. Phila. VIII, I, 1839, 63.—IB. Charlesworth's Mag. N. H. III, 1839, 331.—IB. Townsend's Narrative, 1829, 317.

WAGNER, Suppl. Schreb. Säug. III, 1843, 177.

SCHINZ, Syn. Mam. II, 1845, 10.

("BACH.") AUD. & BACH. N. Am. Quad. I, 1849, 370; pl. xlviii.

Sciurus townsendii, BACH. Jour. Acad. Nat. Sc. Phila. VIII, I, 1839, 63. (Quoted from Mss.)

? *Sciurus mollipilosus*, AUD. & BACH. Proc. Acad. Nat. Sc. Phila. I, Oct. 1841, 102.—IB. Jour. Acad. Nat. Sc. Phila. VIII, II, 1842, 316.—IB. N. Am. Quad. I, 1849, 157; pl. xix.

Sciurus belcheri, J. E. GRAY, Ann. & Mag. N. H. X, 1842, 263.—IB. Zoology of the Sulphur, 1844, 33; pl. xii, fig. 2.

Sciurus suckleyi, BAIRD, Proc. Acad. Nat. Sc. Phila. VII, April, 1855, 333.

Size that of *Sciurus hudsonius*, or a little larger. Ears well tufted; tail shorter than the body, scarcely flattened. Soles naked in the centre. Above dull rusty, and black, mixed; the latter quite predominant; beneath, clear bright buff, without mixture of dark or annulated hairs. A dark stripe on the sides. Tail dull chestnut centrally, darker above; then black and margined all round with rusty white. Hairs at tip of tail entirely black, except at their extremity.

More northern specimens in winter have the soles densely hairy to the toes, the fur much fuller and softer, the under parts with dusky annulations, the general hue grayer. Size about that of *S. hudsonius*, or a little larger. Head short, broad. Whiskers longer than the head; black. Thumb, a mere callosity; fingers well developed, the central two longest and nearly equal; the inner rather longer than the outer; claws large, compressed, and much curved; palms naked. On the hind feet the inner toe is shortest, reaching only to the base of the claw of the outer, which comes next in size; the fourth is longest, the third and second little shorter. Claws all large and much curved. In summer the soles are naked, except along the edges and the extreme heel; in other words, there is a narrow central line of naked skin from near the heel; they are more hairy in winter. The ears are moderate, with short close hairs on their concavity; the back of the ear is covered with long hairs, those near the upper margin longest, and projecting beyond nearly five lines in some specimens; these tufts are nearly black. The tail is small, shorter than the body, moderately flattened; the hairs rather short, and, as on the rest of the body, coarse and stiff.

The general color of the pelage above is uniform mixed dark rusty and black, the annulation being very fine. The hairs are lead color at the base and then annulated with black and rusty. Eyelids, sides of the nose, exterior surfaces of the legs, and whole under parts bright buff. A broad distinct black line on the side between the legs, separating the colors of the sides from the belly. The tail is not "foxy;" the central portion above is much like the back, though with coarser annulations; black at the end, where, as on the sides, it is margined with dull or pale rusty white; beneath it is very similar. At the end of the tail the individual hairs are very dark brown at the base, shading into black, and tipped for about one-fourth the whole length with pale rusty white. On the sides the hairs are dark plumbeous at base, then dull chestnut or rusty; then black and tipped with rusty white. Here, however, as on other parts of the body, these annulated hairs are mixed up with others nearly black, except at tip.

The hairs of the under parts of the body are lead colored at base, then uniform buff, without any annulation whatever.

Finding a considerable difference to exist between the specimens collected on Puget's Sound and those from the Columbia River, I characterized the former, two years ago, under the name of *Sciurus suckleyi*. A very large number of specimens received subsequently has, however,

¹ In the Proceedings of the Zoological Society of London, IV, October, 1836, page 88, Gray names a squirrel from the northwest coast of America, *Sciurus douglassii*, but gives no description whatever.

satisfied me that the peculiar annulation of the under fur is either a condition of the winter fur or else indicates a more or less permanent variety, such as the squirrels are so subject to. This is also the opinion of Dr. Cooper, who is very familiar with the living animal. The description of the supposed species, as prepared at the time, will be found in the accompanying foot note.¹

The changes with season would then be as follows :

In summer, the color beneath is of a uniform bright rusty or tan color, the hairs without any annulation whatever. The ears are more or less tufted, with long hairs growing from their dorsal surface. The soles are hairy to the posterior third, the region behind the tubercles being naked. This character, however, as well as that of the tufts on the ears, varies with the specimen in those killed in the same season.

In winter, especially about Puget's Sound, the fur becomes much fuller and softer, the tufts on the ears increase, the soles become densely hairy to the very bases of the large tubercles at the roots of the toes, the colors beneath are much more cinereous, and, in most cases, the hairs are tipped or annulated subterminally with dusky. The upper surfaces of the hind feet have lost their bright and uniform rufous color by a mixture of black. The tail appears to undergo little change.

¹ SCIURUS SUCKLEYI.—SP. CH.—Larger than *S. hudsonius*. Tail much shorter than the body ; very flat. Ears tufted. Under surface of feet densely clothed with hair to the bases of the toes. Fur full and soft.

Above, mixed chestnut, brown, and black ; beneath, ferruginous, with hairs intermixed of black and black and rusty annulated. A dusky line along the sides. Tail black at the end, margined laterally all round with rusty white ; the hairs annulated, except at tip, with chestnut and black, like the back ; (lighter below.)

Size larger than that of *S. hudsonius*, to which it is closely allied in characters. The head is short and broad ; the whiskers black and longer than the head. The ears appear shorter than they really are from being in a measure buried by the long fur of the back ; that between the ears being nearly half an inch long. The interior surface or concavity thickly covered with short hairs ; the exterior coated with soft long hairs ; these, near the upper margin, projecting beyond it to the extent of four lines in a flattened tuft. Fur everywhere fuller, longer, and softer than in other species examined. Tail much flattened, though not broad ; considerably shorter than the body. Extremities not long ; on the fore foot the third toe is longest ; the second scarcely shorter ; second a little longer than fifth or exterior ; palms naked. On the hind feet the third and fourth toes are about equal ; the fifth reaches to their claw ; the claw of the first extends beyond the base of that of the fifth. The sole is entirely hairy to the base of the toes, the under surface of the tarsus being densely covered ; and the hairs on the outside of all the extremities generally longer and fuller than usual, not lying close pressed as in most other species.

Above and on sides, including two-thirds of the tail, is a finely mixed black and rusty brown, or chestnut brown, much as in *S. douglassii*. Beneath, the hairs are of a dull ferruginous or buff, mixed with others either black or annulated black and rusty. This is only visible, however, when examined closely, and at a short distance the general impression is that of a dull ferruginous. The chin, sides of the snout, and a ring round the eye are purer ferruginous. The outer surfaces of the feet are grizzled, rusty, and black, nowhere of the uniform tint of other species. There is a dusky line on the flanks, separating the colors of the sides from those of the belly ; this appears to run more into the belly posteriorly than usual.

The tail, as already stated, is very much flattened, though narrow ; in shape not much unlike that of *Pteromys*, though not so soft. The upper surface is much like the back, though with a brownish chestnut tinge and coarser annulations. It is black at the extremity and margined all round (sides and tip) with rusty white, darkest on the latter. The single hairs at the tip of the tail are black, except at the extremities ; those on the rest of the tail are dark brown or brownish lead color at the base, and annulated with black and dull chestnut, (brightest above ;) these mixed with hairs almost entirely black. All those on the sides of the tail are tipped with rusty white.

This species is readily distinguishable from its nearest ally, *S. douglassii*, by the softer and longer fur ; more flattened tail, hairy soles, and the mixture of black and annulated hairs on the under parts, a feature rarely observed in other species. *S. mollipilosus* has no dark line on the sides ; no tufts to the ear ; the middle of abdomen is cinereous, not ferruginous ; the tail is longer and not so much flattened. The tail is without the continuous rusty white border. *S. fuliginosus*, Bach., from Louisiana, is said to exhibit the annulations of the hairs below ; but the prevailing color there is brownish ; the prevailing color of the tail, black above ; the ears are clothed with short hair ; there is no dusky stripe on the side, nor a rusty white border to the tail ; the geographical distribution, too, is very widely remote. *P. lanuginosus* agrees in character of fur as to softness and length, but it has the feet entirely hairy to the claws ; the under parts, too, are pure white, with other differences.

The specimens collected by Dr. Newberry in the Cascade Mountains are in very high summer condition, and differ very appreciably from more northern ones. The belly is of a much paler shade of red and uniform in its tints, the black line on the side very distinct. The tail is much fuller, the hairs longer, though still depressed. Some specimens exhibit no red at all on the tail, the colors being throughout black, gray, and white; thus, on the terminal half, they are grayish white, with a median annulation of black, the tip of the hairs whiter than the base. Towards the tip of the tail the black increases in extent, until, at the end, it occupies all the hair, except the white tips and a very obsolete indication of gray at the base. In this condition the tail exactly resembles, in every respect, that of *S. fremontii*, and the two, comparing numbers 1160 and 520, could not be distinguished from each other, except by the white belly of the latter. I consider it quite possible, if not very probable, that these may be two varieties of color of the same species, such as we see in other squirrels, even if the *S. douglasii* of Oregon be considered distinct again or not.

Specimens from Petaluma, California, are similar to Oregon ones in the brightness of the under fur, in which, however, there are some dusky-tipped hairs. The soles are densely hairy to the tubercles, the posterior one not entirely covered. The tail is rather more red than in the Cascade Mountain skins. This species, if all the specimens I have referred to it are correctly named, is found on and west of the Cascade Mountains, from California to the head of Puget's Sound. Throughout this range it appears to be quite abundant, and supplies the place of the little Red Squirrel of the eastern States.

It was probably named by Gray in 1836, but certainly not described by any one before Bachman, in 1838. Gray described it anew in 1842 as *S. belcheri*, from the mouth of the Columbia.

I have already referred to the probable identity of my *Sciurus suckleyi* with this species, and I have no doubt that the *Sciurus mollipilosus* of Audubon and Bachman is the same animal in the cinereous pelage ascribed to the above species. All the remarks respecting the one in the preceding article apply equally to the other; and if these should really be two species, then the name of *S. mollipilosus* should take precedence over that which I have imposed. From the remark that the cinereous of the under parts is in some places lightly tinged with rufous, I infer that the specimen described of *S. mollipilosus* was in a transition state between the summer and winter pelage.

List of specimens and measurements.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—		
								Nose to eye.	Nose to ear.	Nose to occi-put.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore fl. length.	Hind fl. length.	Skull, length.		Skull, width.	Height of ear.
218		♂	Chickwas, Wash. Territory	Aug. 9, 1853	Gavner I. I. Stevens.	4	Skin				7.50	4.50	6.25		1.83			.50	Dr. J. G. Cooper.
359	1273		Steilacoom, Wash. Territory	Jan. 20, 1854	do.	3	Mounted									1.75			Dr. Geo. Suckley, U. S. A.
380	1274	♂	do.	Jan. 13, 1854	do.	1	Skin				9.00	4.50	6.00		1.80			.50	do.
272		♂	do.	Jan. 2, 1854	do.	2	do.				8.50	4.25	6.00		1.80				do.
273		♂	do.	Jan. 15, 1854	do.	17	do.												do.
274		♂	do.	Summer?	do.		do.												do.
658		♂	do.	March, 1856	Dr. George Suckley, U. S. A.	76	do.								1.80				do.
1958		♂	do.	do.	do.	77	do.												do.
1960		♂	do.	do.	do.	78	do.												do.
1951		♂	do.	do.	do.	79	do.												do.
1956		♂	do.	do.	do.	75	do.												do.
1959		♂	do.	do.	do.		do.												do.
1961		♂	do.	do.	do.		do.												do.
2423		♂	do.	1856	do.		In alcohol	.90	1.70	1.90	8.00			1.30	2.00				do.
2434		♂	do.	1856	do.		do.	.80	1.55	2.00	7.50	5.00	6.25	1.30	2.00				do.
2425		♂	do.	1856	do.		do.	.90	1.70	2.00	7.50	5.00	6.00	1.30	1.85				do.
2436		♂	do.	1856	do.		do.	.80	1.50	1.80	6.50	4.50	5.25	1.10	1.80				do.
210	1181	♂	Fort Vancouver, W. T.	July 20, 1853	Governor I. I. Stevens.	2	Skin												Dr. J. G. Cooper.
202	1173	♂	do.	1853	do.	1	do.												do.
1420		♂	do.	Febr'y, 1856	George Gibbs		do.												do.
1421		♂	do.	do.	do.		do.												do.
756		♂	Oregon	do.	Dr. J. Evans		do.									1.80	1.04		do.
2001		♂	Washington Territory	do.	do.		do.									1.85	1.07		do.
88		♂	Columbia River	do.	Philadelphia A. N. S.		Skull				8.50	4.00	5.90		1.90				J. K. Townsend.
811		♂	Astoria	do.	Lt. Trowbridge, U. S. A.		Skin												do.
1265	2269	♂	Upper des Chutes, Cal.	do.	Lt. R. S. Williamson, U. S. A.		do.				7.50	3.75	5.95		1.90	1.86	1.09		Dr. J. S. Newberry.
1160	2042	♂	do.	do.	do.		do.				8.00	4.00	5.60		2.00				do.
1184		♂	Head of des Chutes	do.	do.		do.				8.00	4.00	5.60		1.90				do.
1187		♂	Cascade Mountains, lat. 44.	do.	do.		do.												do.
2409		♂	Petaluma, Cal. (Redwoods)	Winter	E. Samuels	206	do.	.80	1.70	1.90	7.00	5.25	6.90	1.25	1.90				do.
2408		♂	do.	do.	do.	203	In alcohol	.80	1.60	1.90	7.00	5.25	7.00	1.20	2.00				do.
2410		♂	do.	do.	do.	205	do.	.90	1.70	1.90	7.00	5.00	7.00	1.30	1.85				do.
2411		♂	do.	do.	do.	207	do.	.80	1.50	1.75	7.00	4.75	5.25	1.25	1.70				do.
2412		♂	do.	do.	do.	204	do.	.85	1.70	1.90	7.25	5.50	7.00	1.20	2.00				do.
2414		♂	do.	do.	do.		Skull									1.84			do.

* Measured before being skinned.

CONCLUDING REMARKS.

In the preceding pages I have presented at considerable length all the species of squirrels which I have been able to identify as inhabitants of North America, north of Mexico. There are still a good many species credited to the same region, which it may be as well to notice briefly for the sake of completing the history of the genus. Comparatively few of these, however, if any, will ever be detected within our limits, as the unexampled scientific activity of the government expeditions and private parties that have recently traversed this continent in every direction, have left few localities unexplored.

A considerable number of these residuary species were described at an early date by Dr. Bachman, as coming from "California." Most of them are, however, probably natives of Mexico, which, in its southern regions especially, abounds in large squirrels with bushy tails, and so variable in color as to render it exceedingly difficult to say how many species really exist. These Mexican squirrels are actually more varied in tint than those of the United States, the upper parts often showing the same white, yellow, or red, as the belly, in large isolated patches—a character rarely, if ever, seen in the more northern species. In the many species described by different authors, and the entire lack of Mexican specimens, I shall not pretend to determine the actual number of species really existing, or to settle the question of priority of description. I shall merely enumerate all that have been credited to Mexico and Central America.

The species of Dr. Bachman may have been brought from the southern part of Sonora, Mexico—the distinction between the lower and upper parts of this State not being as carefully drawn twenty years ago as now. It is to be regretted that no mention is made of the collector of his specimens, or of the circumstances under which they were gathered; we are equally ignorant of the place where they were deposited at the time of description, or where they are now. It is possible that *Sciurus leporinus* and *lanigerus* have a real existence as North American squirrels, and that the former may really be an immature *S. fessor*.

I shall first proceed to enumerate the residuary species described as North American by Audubon and Bachman; then the Californian, Mexican, and Central American species, of other authors; then the South American bushy tailed species; and conclude with a list of all the species referred to, alphabetically arranged, with an indication of the page of this report where they are mentioned.

A *Sciurus clarkii*, figured by Major C. Hamilton Smith, from a specimen in the old Peale's Museum of Philadelphia, said to have been brought by Lewis and Clark from the Missouri country, furnishes no characters by which it can be identified with any distinct North American species. It is reasonable to presume that there is some error in the locality as given, since Lewis and Clark make no mention of such an animal in their very full notices of the zoology of the regions explored by them.¹

SCIURUS CLARKII, Smith, Hab., Missouri river?—*Sciurus clarkii*, SMITH, Griff., Cuvier, III, 1827; 189, plate.

"Back, upper part of the head, and neck, cheeks, and tail, of a delicate silver gray color; the shoulders, flank, belly, and posterior extremities, both within and without, white, with a slight ochrey tint; on the sides of the nose and the fore arms this tint deepens in intensity. The head is rather flattened and thick; the ears small and round; the eyes far apart, leaving a wide expanse of forehead; nostrils semi-lunar—the upper lip cleft; a black spot on the chin. Tail flat and spreading,

1. *Species described as North American by Audubon and Bachman.*

SCIURUS COLLIAEI, Richardson. Hab. San Blas, Mex.

Sciurus colliaci, RICH. Zool. of Blossom, 1839, 8; pl. i.

BACHMAN, Pr. Zool. Soc. Lond. VI, Aug. 1838, 95, (named, but not described.)—IB. Charlesworth's Mag. N. H. III, 1839, 334,—IB. Sill. Am. Jour. Sc. XXXVII, 1839, 307.

WAGNER, Suppl. Schreb. III, 1843, 174.

AUD. & BACH. N. Am. Quad. III, 1853, 21; pl. civ.

Size of *Sciurus carolinensis*; tail about as long as the body. Above grizzled with black and dull yellow. Sides of muzzle, under parts of body, and inner sides of limbs dull white. Tail moderate, the hairs grayish white, three times annulated with black. Back of ears grizzled with black and yellow, posteriorly covered with long whitish hairs. Legs and feet dirty cream color, pencilled with dusky. Nose to root of tail, $10\frac{3}{4}$ inches; tail to end of hairs, $9\frac{1}{2}$; hind foot from heel, $2\frac{5}{8}$ inches.

This species, as avowedly coming from the west coast of Mexico, has no claim whatever to a place in the fauna of the United States. It appears to resemble, in some respects, the small gray squirrel described from Santa Caterina, Mexico, under the head of *Sciurus carolinensis*? page 263.

SCIURUS MUSTELINUS, Aud. & Bach. Hab. California.

Sciurus mustelinus, AUD. & BACH. Pr. A. N. Sc. Phila. I, Oct. 1841, 32—IB. Jour. A. N. Sc. Phila. VIII, II, 1842 312.—IB. N. Am. Quad. III, 1854, 258; pl. cliii, fig. 1.

“Neck very long; tail longer than the body; hair, short, rigid, glossy; the whole body jet black. Length to root of tail, 10 inches; of tail, (with hairs?) 13 inches; height of ear, 6 lines; hind foot, $2\frac{5}{8}$ inches.”

This species in many respects resembles *Spermophilus couchii*, but we are assured that it is a true squirrel.

SCIURUS NIGRESCENS, Bennett. Hab. Lower California.

Sciurus nigrescens, BENN. Pr. Zool. Soc. Lond. I, 1833, 41.

BACHMAN, Pr. Zool. Soc. Lond. VI, 1838, 96.—IB. Charles. Mag. N. H. III, 1839, 334,—IB. Sill. Am. Jour. Sc. XXXVII, 1839, 306.

WAGNER, Suppl. Schreb. III, 1843, 174.

AUD. & BACH. N. Am. Quad. III, 1853, 741; pl. cxvii.

Dusky, slightly grizzled on the body with gray; sides dusky yellow; beneath dingy gray; tail much longer than the body, nearly cylindrical, the hairs broadly tipped with white.

Length to root of tail, $12\frac{4}{8}$ inches; tail to end of hairs, $15\frac{4}{8}$; hind foot, $2\frac{8}{8}$.

SCIURUS LANIGERUS, Aud. & Bach. Hab. Northern California.

Sciurus lanigerus, AUD. & BACH. Pr. Ac. N. Sc. Phila. I, 1841, 100.—IB. Jour. Ac. N. Sc. Phila. VIII, II, 1842, 310.—IB. North Amer. Quad. I, 1849, 214; pl. xxvii.

“Head all round, ears, and legs black. Fur on the back light plumbeous on the basal half,

very beautiful, narrowed at base, then widening to middle, and diminishing to a point.” The figure represents the tail as rather cylindrical, and with the hairs, rather shorter than the head and body.

This animal has, by some, been referred to as a spermophile, though with no definite reason. I know of no permanent variety of squirrel resembling this description at all. It has much the characters, in part, of an albino. At any rate, there is little doubt that no such animal inhabits western North America as a distinct and true species.

then light brown, and tipped with white and black. Hairs of tail brownish black at base, then light brown, then brownish black, and tipped with ashy white. Hairs beneath, light plumbeous at the base, and tipped with light brown and black; throat light grayish brown. The feet and toes are hairy to the extremity of the nails. The tail is large and bushy, scarcely distichous. The hair generally is long and woolly.

"Length to root of tail, about 12 inches; of tail to end of hairs, 11 inches; hind foot from heel, $2\frac{1}{2}$ inches."

There are several peculiar features about this squirrel, although its dusky tipped hairs on the belly seem to indicate it as one of several varieties of a single species. The figure indicates a dusky line on the flanks not mentioned in the description, as well as a greater amount of reddish in the belly than the text would indicate.

SCIURUS LEPORINUS, Aud. & Bach. Hab. Northern California.

For the synonymy of this species, and some remarks respecting its affinities, see *S. fossor*.

SCIURUS FERRUGINIVENTRIS, Aud. & Bach.

Sciurus ferruginiventris, AUD. & BACH. Pr. Acad. Nat. Sc. Phila. I, Oct. 1841, 101.—In. Jour. Acad. Nat. Sc. Phila. VIII, II, 1842, 313.—In. N. Am. Quad. I, 1849, 292; pl. xxxviii.

Tail longer than the body. Size rather smaller than that of the Carolina gray squirrel. A line of soiled white on the neck behind the ears. Upper parts a light grizzled gray; a reddish brown wash on the outer surface of the fore legs, over the shoulders, nearly meeting on the back. Under parts, with a line around the eye, and inner surface of the legs, of a uniform bright rufous. Sides of face and chin light gray. Hairs of tail black at the roots, then yellowish, then a broad line of black, tipped with white.

Length of head and body, $8\frac{1}{2}$ inches; of tail, 10; height of ear, $\frac{5}{12}$; length of hind foot, $2\frac{5}{12}$.

2. Californian, Mexican, and Central American species of other authors.

SCIURUS BOTTAE, Lesson. Hab. California.

Sciurus bottae, LESSON, Centurie Zool. 1830, 221; pl. lxxvi.—In. Desc. des Mammif. et Ois. 1847, 140.
WAGNER, Suppl. Schreb. III, 1843, 172.
SCHINZ, Synopsis, II, 1845, 10.

Length of head, 2 inches; head and body, $9\frac{1}{2}$; tail, $6\frac{1}{2}$. Tail rounded, slightly distichous, and rather pointed. Ears pointed. Thumb rudimentary. Pelage rather stiff. Each hair is white, brown, whitish yellow, and rusty. The general color is yellow, washed with reddish and black; beneath, pale yellow. Tail yellow and brown; the tips pale yellow. Ears black above and on the inner face.

According to John Edward Gray, this species is the same with *Spermophilus beecheyi*. I do not recognize this species in it, but think it may be some one of the Mexican or Lower California *Spermophilus*.

SCIURUS CALIFORNICUS, Lesson. Hab. California.

Sciurus (Macrozus) californicus, LESSON, Desc. des Mamm. et d'Oiseaux, 1847, 143.

"Size of the European squirrel. Ears not tufted. Tail flattened. A whitish ring around the eye. Hairs on the head above dotted with brown on a vinaceous ground. Cheeks and throat pale gray. Color above generally vinaceous gray, dotted with pale gray and black; the ground color more gray on the nape and neck, more rufous on the rump; vinaceous rose on the anterior and posterior limbs. The dotted gray of the back is cut by a straight white band which extends on each side from the upper part of the shoulder to the *chute des reins*, before the origin of the tail. Lower parts and flanks whitish. All the hairs of these parts are half black and terminated with white only. Tail above white and black, white on the edge; beneath, white bordered and terminated with black. Each hair is white at base and tip, black in the middle."

This description, in many respects, agrees with *Spermophilus beecheyi*, especially in the whitish stripe on the sides of the shoulders. If from Upper California, there is no other species to which it can be referred.

SCIURUS AUREOGASTER, F. Cuv. Hab. Mexico.

Sciurus aureogaster, "F. Cuv. Mammif. III, livraison 59."

WAGNER, Suppl. Schreb. III, 1843, 165.

GEOFF. Voy. de la Venus, Zool. 1855, 136; pl. x, xi.

Sciurus leucogaster, F. Cuv. Suppl. Buffon, I, Mammif. 1831, 300. (Ecureuil de la Californie.)

Above, mixed white and black, or yellowish; beneath, golden yellow. Length, 10 inches; tail, 8 inches.

According to Geoffroy, this squirrel was collected at Monterey, by the French frigate the *Venus*; none of our collections from this locality, however, give any indication of such a species.

SCIURUS PYLADII, Lesson. Hab. Realejo, Mexico.

Sciurus (Macrozus) pyladii, LESSON, Desc. Mamm. et Oiseaux, 1847, 142.

SCIURUS VARIEGATUS, Erxleben. Hab. Mexico.

Sciurus variegatus, ERXLEBEN, Syst. 1777, 421.

FISCHER, Synopsis, 1829, 352.

SCHINZ, Syn. II, 1845, 17.

Above, varied with black, rufous, and orange; beneath, rufous orange; occiput black. Snout and ears white. Length, one foot.

SCIURUS HYPOPYRRHUS, Wagler. Hab. Mexico.

"*Sciurus hypopyrrhus*, WAGLER, Isis, 1831, 510."

"WAGNER, Münchn. Gel. Anz. VII, 20."

Above, mixed black and dirty yellow; beneath, ferruginous; ears and feet black; tail longer than the body, uniform in color with the back; the hairs of only two colors.

Length, 12 inches; tail vertebræ, $12\frac{1}{2}$; tail with the hairs, $14\frac{8}{12}$.

SCIURUS VARIUS, Wagner. Hab. Pine forests of the Cordilleras of Oaxaca, Mexico.

Sciurus varius, WAGNER, Suppl. Schreb. III, 1843, 168.

Sciurus albipes, WAGNER, Abh. K. B. Akad. Wiss. (Math. Phys.) II, 501.—*Is.* in plates of Schreber Säugt. IV; tab. 213 D.

? *Sciurus variegatus*, ERXLEBEN, Syst. 1777, 421.

Above, mixed white, black, and ferruginous; beneath, ochrey ferruginous; feet, and a spot behind the ear, white; tail centrally, ferruginous; on the sides, banded with black and white.

Length of head and body, 11 inches; of tail vertebræ, 8; of tail with the hairs, 10 $\frac{3}{4}$.

This species, in some respects, especially in the ferruginous belly and white post-auricular patch, approaches the *S. ferruginiventris* of Audubon and Bachman.

SCIURUS SOCIALIS, Wagner. Hab. the Tierra Caliente of the west coast of Tehuantepec.

Sciurus socialis, WAGNER, in Abh. K. Bay. Akad. der Wissensch. (Math. Phys.) II, 504; tab. v.—*Is.* Suppl. Schreb. III, 1843, 171.

Above, mixed white, cinereous, and yellowish; beneath, pale rusty yellow; ears fulvous; feet white; fur soft. A tuft of snow white hair behind the ear. Tail rusty red beneath, then black, then bordered with white.

Length, 8 $\frac{1}{2}$ inches; tail a little less.

3. South American squirrels with long bushy tails.

SCIURUS LANGSDORFFII, Brandt. Hab. Brazil.

Sciurus langsdorffii, BRANDT, Mem. Acad. St. Petersburg, 1835, 425; tab. xi.

WAGNER, Suppl. Schreb. III, 1843, 184.

SCIURUS DIMIDIATUS, Waterhouse. Hab. South America.

Sciurus dimidiatus, WATERHOUSE, Ann. & Mag. N. H. VI, 304.

WAGNER, Suppl. Schreb. III, 1843, 184.

SCIURUS VARIABILIS, Is. Geoffr. Hab. Colombia.

Sciurus variabilis, Is. GEOFFR. Etudes Zool. I; tab. iv.

WAGNER, Suppl. Schreb. III, 1843, 184.

SCIURUS VARIEGATOIDES, Ogilby. Hab. west coast of South America.

Sciurus variegatoides, OGILBY, Ann. & Mag. N. H. V, 63.

WAGNER, Suppl. Schreb. III, 1843, 185.

SCIURUS GRISEOCAUDATUS, Gray. Hab. west coast (South?) America.

Sciurus griseocaudatus, J. E. GRAY, Zool. of Sulphur, 1844, 34; pl. xiii, f. 2 (animal); pl. xviii, figs. 7, 12, (skull.)

Fox-colored beneath. Head and body, 10 inches

Alphabetical list of the different species of squirrels referred to in the preceding pages.

Original name.	Referred to under—	Locality, real or reputed.
	Page.	
<i>Sciurus</i> * <i>aberti</i> , Woodhouse.....	<i>Sciurus aberti</i> , Woodhouse..... 267	New Mexico.....
<i>auduboni</i> , Bachman.....	<i>ludovicianus</i> , Custis..... 251	New Orleans.....
<i>aureogaster</i> , F. Cuvier.....	<i>aureogaster</i> 282	California.....
<i>belcheri</i> , Gray.....	<i>douglasii</i> , Gray..... 275	Oregon.....
<i>bottae</i> , Lesson.....	<i>Spermophilus</i> ?..... 281	California.....
<i>californicus</i> , Lesson.....	<i>Spermophilus</i> ?..... 282	do.....
<i>capistratus</i> , Bosc.....	<i>Sciurus vulpinus</i> , Gm..... 246	S. Atlantic and Gulf States.....
* <i>carolinensis</i> , Gm.....	<i>carolinensis</i> , Gm..... 256	United States.....
* <i>castanotus</i> , Baird.....	<i>castanotus</i> , Baird, and <i>S. aberti</i> , 266	New Mexico.....
	Woodhouse.	
* <i>cinereus</i> , Gmelin.....	<i>cinereus</i> , Gmelin..... 248	Maryland, Pennsylvania, and Virginia.
<i>clarkii</i> , Smith.....	<i>Spermophilus</i> ?..... 289	Missouri river.....
<i>colliaci</i> , Richardson.....	<i>colliaci</i> , Rich..... 280	San Blas, Mexico.....
<i>dorsalis</i> , Woodhouse.....	<i>Sciurus aberti</i> , Woodhouse..... 267	New Mexico.....
<i>douglasii</i>	<i>douglasii</i> 275	Oregon.....
<i>ferruginiventris</i> , Aud. and Bach..	<i>ferruginiventris</i> , Aud. and Bach. 281	California.....
* <i>fossor</i> , Peale.....	<i>fossor</i> , Peale..... 264	California and Oregon.....
* <i>fremontii</i> , Townsend.....	<i>fremontii</i> , Townsend..... 272	Rocky Mountains.....
<i>fuliginosus</i> , Aud. and Bach.....	<i>carolinensis</i> , Gm?..... 257	New Orleans.....
<i>griseocaudatus</i> , J. E. Gray.....	<i>griseocaudatus</i> , Gray..... 283	W. coast of America.....
<i>heermanni</i> , Le Conte.....	<i>fossor</i> , Peale..... 264	California.....
* <i>hudsonius</i> , Pallas.....	<i>hudsonius</i> , Pall..... 269	United States.....
<i>hyemalis</i> , Ord.....	<i>cinereus</i> , Gm..... 248	New Jersey.....
<i>hypopyrrhus</i> , Wagner.....	<i>hypopyrrhus</i> , Wagner..... 282	Mexico.....
<i>langsдорffii</i> , Brandt.....	<i>langsдорffii</i> , Brandt..... 283	Brazil.....
<i>lanigerus</i> , Aud. and Bach.....	<i>lanigerus</i> , Aud. and Bach..... 281	Northern California.....
<i>lanuginosus</i> , Aud. and Bach.....	<i>richardsonii</i> , Bach..... 273	Sitka.....
<i>leporinus</i> , Aud. and Bach.....	<i>leporinus</i> , and <i>fossor</i> 264	Northern California.....
<i>leucogaster</i> , F. Cuvier.....	<i>aureogaster</i> , F. Cuv..... 282	Mexico and California.....
<i>leucotis</i> , Gapper.....	<i>carolinensis</i> , Gm..... 257	Northern States.....
<i>levisi</i> , Smith.....	<i>ludovicianus</i> , Custis..... 251	Missouri river.....
* <i>limitis</i> , Baird.....	<i>limitis</i> , and <i>ludovicianus</i> 256	San Pedro, Texas.....
* <i>ludovicianus</i> , Custis.....	<i>ludovicianus</i> , Custis..... 251	Western States.....
<i>macrourus</i> , Say.....	do..... 251	Missouri.....
<i>magnicaudatus</i> , Harlan.....	do..... 251	Missouri river.....
<i>mexicanus</i> , Erxleben.....	<i>Spermophilus mexicanus</i> , Licht..... 000	Mexico.....
<i>migratorius</i> , Bach.....	<i>Sciurus carolinensis</i> , Gm..... 257	Northern States.....
<i>mollipilosus</i> , Aud. and Bach.....	<i>douglasii</i> , Gray..... 275	N. California.....
<i>mustelinus</i> , Aud. and Bach.....	<i>mustelinus</i> , Aud. and Bach..... 280	California.....
<i>niger</i> , (Auct. except of Linn.).....	<i>carolinensis</i> , Gm..... 257	N. United States.....
<i>niger</i> , Linnaeus.....	<i>vulpinus</i> , Gm..... 246	Southern coast States.....
<i>nigrescens</i> , Bennett.....	<i>nigrescens</i> , Benn..... 280	California.....
<i>occidentalis</i> , Aud. and Bach.....	<i>ludovicianus</i> , Custis..... 251	Western America.....
<i>pennsylvanicus</i> , Ord.....	<i>carolinensis</i> (<i>niger</i>) Gm..... 257	Pennsylvania.....

* NOTE.—The species marked with an asterisk are described in full as really good North American species. *S. limitis* and *castanotus* are doubtful.

Alphabetical list—Continued.

Original name.	Referred to under—	Locality, real or reputed.
	Page.	
<i>Sciurus pyladeii</i>	<i>Sciurus pyladeii</i> 282	Mexico
* <i>richardsonii</i> , Bach	<i>richardsonii</i> , Bach 273	Rocky Mountains
<i>rubicaudatus</i> , Bach	<i>ludovicianus</i> , Custis 251	Illinois
<i>rubrolineatus</i> , Desm	<i>hudsonius</i> , Pall 269	United States
<i>rufiventer</i> , Geoffroy	? <i>ludovicianus</i> , Custis 251	New Orleans
<i>sayi</i> , Aud. and Bach	do 251	Missouri
<i>socialis</i> , Wagner	<i>socialis</i> , Wagner 283	Mexico
<i>subauratus</i> , Bach	<i>ludovicianus</i> , Custis 251	New Orleans
<i>suckleyi</i> , Baird	<i>douglassii</i> , Gray 275	Puget's Sound
<i>texianus</i> , Aud. and Bach	<i>vulpinus</i> , Gm 246	Texas
<i>variegatus</i> , Erxleben	<i>variegatus</i> and <i>vulpinus</i> , Gm 282	Mexico
<i>variegatoides</i> , Ogilby	<i>variegatoides</i> , Ogilby 283	West coast South America
<i>varius</i> , Wagner	<i>varius</i> , Wagner 283	Mexico
<i>virginianus</i> , Kerr	<i>cinereus</i> , Gm 249	Virginia
* <i>vulpinus</i> , Gm	<i>vulpinus</i> , Gm 246	South coast States

PTEROMYS, Cuvier.

Pteromys, CUVIER, "Leçons d'Anatomie, I, 1800."—Aud. & Bach., N. Am. Quad. I, 1849, 132.

A densely furred membrane, extending laterally from the sides between the fore and hind feet. Permanent molars five. Muzzle short. A deep supra-orbital notch.

The genus *Pteromys* is most remarkably characterized by the membranous expansion of the sides between the fore and hind feet, by means of which the animal is enabled to glide through the air from one tree to another, supported as by a parachute. Anteriorly this membrane is attached, in part, to a slender bone springing from the hand.

There are two distinct sections of the genus *Pteromys*, which may be characterized as follows:

1. *Pteromys*. Tail rounded. Molars complicated. Post-orbital process very large.
2. *Sciuropterus*. Tail depressed and flattened. Molars simple, as in other squirrels.

All the American and European species belong to the second division.

In general appearance the skull of the American *Pteromys* is very similar to that of the short-nosed squirrels, like *Sciurus hudsonius*. The post-orbital processes are a little longer and more recurved. The supra-orbital notch is very deep, so that the width of the frontal bone at that point is considerably less than behind the post-orbital processes. The upward bend of the zygoma at the zygomatic plate is more abrupt than in any other *Sciurinae*. This plate itself is nearly plain, and is not perforated as in *Tamias*, the ante-orbital foramen being more anterior and vertically elongated. There are always five upper molars, the anterior quite rudimentary, and barely in advance of the notch of the posterior edge of the zygomatic plate. The inner outlines of the alveoli are straight and parallel.

The skull is distinguishable from that of *Sciurus* by the depth and size of the supra-orbital notch; agreeing, however, with that of *S. hudsonius* in the shortness of the muzzle. It is much fuller and more convex than that of *Tamias*, with a shorter muzzle, zygomatic plate not perforated, and five upper molars. The auditory bullae are very large.

I regret that I am unable to describe any species but *P. volucella* in detail; the flying squirrels being more poorly represented in the collection of the western expeditions than any other mammals. It is not improbable, however, that one, at least, of the species of Audubon and Bachman may be a synonym, as the proportional length of the tail and the amount of expansion of the flying wing membrane, are not to be determined with any degree of precision in dried specimens of animals so readily over-stretched as the flying squirrel.

I have not been able to make any comparison of European flying squirrels with the American, for want of specimens.

PTEROMYS VOLUCELLA.

Flying Squirrel.

- Sciurus volucella*, PALLAS, Glires, 1778, 351, 353, 359.
 GMELIN, Syst. Nat. I, 1788, 155.
 SCHREBER, Säugethiere, IV, 1792, 808; tab. ccxxii.
 SHAW, Gen. Zoology, II, 1801, 155; tab. clv.
Pteromys volucella, DESMAREST, Mamm. II, 1822, 343.
 HARLAN, Fauna Americana, 1825, 187.
 GRIFFITH'S, Cuvier, V, 1827, 259.
 FISCHER, Synopsis, 1829, 365.
 GODMAN, American Natural History, II, 146.

Pteromys volucella, YARBELL, Pr. Comm. Science Zool. Soc. London, I, 1830, 38. (Anatomy.)

DEKAY, N. Y. Zoology, I, 1842, 65; pl. xvi, fig. 2.

WAGNER, Supplement Schreber, III, 1843, 231.

AUD. & BACHMAN, N. Am. Quad. I, 1849, 216; pl. xxviii.

KENNICOTT, Rep. Pat. Office, 1856, Agricultural, (1857), 69; pl. vii.

"*Sciuropterus volucella*, GEOFFROY, Dict. Class XIV, 132."

?? *Sciurus acrobates*, (Linn.) SCHREBER, Säugt. IV; tab. cccxii, B. no text

Flying squirrel, PENNANT, Hist. Quad. 1781, No. 283.—*Ib.* Arctic Zoology, 1784, 120.

Assapan, ST. HILAIRE, and CUVIER, Hist. des Mammif. III, 1819; plate.

SP. CH.—Tail, with hairs, nearly as long as the head and body. Above light yellowish brown; the tail similarly colored, or with a more smoke-colored tinge. Beneath creamy white, the hairs white to the roots; under surface of tail more reddish. Length of head and body about 5 inches; of tail, with hairs, half an inch less; hind feet 1.20 inch.

The ears of this species are large and broad; much thinner and more ample than in the ordinary squirrels. Their concavity is nearly naked; the back is covered with very short hairs. The head is short, broad and depressed. The muffle is entirely hairy, except on the septum and the extreme edge of the nostrils, which are naked. The upper lip is deeply cleft, the fissure extending to the nose, and continued on the septum as a groove. The whiskers are very long, and extend as far as the axillae.

The feet are only moderately large; the first fore finger is very rudimentary, in fact apparently wanting; nor have I been able in preserved specimens to detect the presence of a nail or claw. The other four fingers are very deeply cleft, so much so that they occupy rather more than one-half of the total length of the hand from the wrist. The central two fingers are longest and equal; the fifth claw reaches to the base of the fourth; the second finger is a little shorter than the fifth. The hind toes are long, but less so in proportion than the anterior ones. The palms are naked; the soles densely hairy from the heel to the large tubercles at the bases of the toes; in some cases even the under surfaces of the toes appear more or less hairy. The claws, the anterior especially, are excessively short and much curved. The lateral membrane is supported anteriorly by a bony process articulated to the wrist, and extending backwards, slightly divergent, from the fore arm; it is longer than the hand, and but little shorter than the foot, (.82 in 2309.) This bony process is freely articulated with the wrist, and is capable of so extending or stretching out the flying membrane, that when at nearly a right angle with the hand it carries the anterior edge of the membrane with it at the same angle; and then the anterior portion of the lateral edge will be at right angles with the anterior edge proper, and be parallel with the arm. In this event such a prominent angle of the membrane will be produced as is described as characteristic of *Pteromys oregonensis*, as distinguished from other species. If not artificially stretched out, as appears to have been done with Townsend's specimen of the last-mentioned species, the process lies flat to the arm, and then the membrane appears to start from the wrist, and extends along the side of the body with little or no appreciable angle.

The tail is very much flattened, though broad, and about the width of the head. The hairs are arranged on either side somewhat like the flumes of a pen.

The fur of this animal is exceedingly soft and silky; the upper parts are of a light yellowish brown; the tail is quite similar, with perhaps more of a light smoky tint; the hair is of nearly the same color from the roots; the hairs of the back are dark brown, excepting at the tip; the under parts are of a creamy white; the tail, with a grayish rusty tinge, the hairs white to the roots. The sides of the head are grayish; of the muzzle and cheeks whitish; there is a suffusion of darker round the eyes.

This species appears to vary somewhat in size, though but little in color. Specimens from the south are darker above, and the tail has rather a rusty tinge.

Measurements of skulls.

Current number.	Locality.	Length.	Width.
172	Carlisle, Pa.....	1.41	.....
173	do.....	1.30	.88
949	Racine.....	1.33	.76

List of specimens.

Catalogue number.	Corresponding number of skull.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Measurements.							
						From tip of nose to—				Tail to end of—		Length of—	
						Eye.	Ear.	Occip.	Tail.	Vert.	Hairs.	Fore ft.	Hind ft.
536		Montreal, Can.....	.....	Thomas Broome.....	Skin.....	.....	.....	.....	5.60	.....	.....	.....	1.20
2508		Middleboro', Mass.....	Spring, 1856..	J. W. P. Jenks.....	In alcohol..	.60	1.18	1.50	4.70	3.40	4.90	.87	1.20
2509		do.....	do.....	do.....	do.....	.60	1.18	1.50	4.70	3.70	4.40	.80	1.14
2510		Essex county, N. Y.....	.....	Dr. S. E. Hale.....	do.....	.50	1.00	1.35	3.40	2.60	3.00	.70	1.09
860		New York city.....	.....	Geo. N. Lawrence...	Skin.....	.....	.....	.....	5.00	2.90	4.10	.....	1.14
.....		Washington, D. C.....	.....	Dr. Nichols.....	In alcohol..	.....	.....	.....	.....	.....	.....	.....	.....
2504		Columbus, Ga.....	.....	Dr. W. Gesner.....	do.....	.60	1.20	1.50	4.76	3.60	4.20	.73	1.19
2505		do.....	.....	.....do.....	do.....	.55	1.14	1.46	4.55	3.50	4.18	.70	1.10
2506		West Northfield, Ill.....	.....	R. Kennicott.....	do.....	.60	1.20	1.50	4.76	3.60	4.30	.73	1.23
827		Racine, Wis.....	.....	Dr. P. R. Hoy.....	Skin.....	.....	.....	.....	5.00	.....	.....	.....	1.20
258		do.....	.....	.....do.....	do.....	.....	.....	.....	4.20	3.40	4.10	.....	1.05
786		Columbus, Miss.....	.....	Dr. W. Spillman.....	In alcohol..	.....	.....	.....	5.00	3.60	4.10	.....	1.10
787		do.....	.....	.....do.....	do.....	.....	.....	.....	4.80	3.40	3.90	.....	1.02
1259	342	Prairie Mer Rouge, La.....	.....	Jas. Fairie.....	Mounted...	.....	.....	.....	.....	.....	.....	.....	.....
2552		do.....	.....	.....do.....	Skin.....	.....	.....	.....	5.20	3.20	4.00	.....	1.08

PTEROMYS HUDSONIUS.

Northern Flying Squirrel.

Sciurus hudsonius, Gmelin, Syst. Nat. I, 1788, 153.

Pteromys hudsonius, Fischer, Synopsis, 1825, 365.

Sciurus sabrinus, Shaw, Gen. Zool. Mamm. I, 1801, 157.

Pteromys sabrinus, Rich. Zool. Jour. III, April, 1828, 519.—Ib. Fauna Bor. Amer. I, 1829, 193.

Wagner, Suppl. Schreber, III, 1843, 228.

Aud. & Bach. N. Am. Quad. III, 1853, 202; plate cxliii, fig. 1.

Seymour river flying squirrel, Pennant, Hist. Quad. II, 1781, 418.—Ib. Arctic Zool. I, 1784, 122.

SP. CH.—Considerably larger than the *P. volucella*, or common flying squirrel. Tail considerably shorter than the head and body; (shorter than the body alone?) Above, yellowish brown; beneath, white; the hair plumbeous at root. Length of head and body about eight inches; of tail, with hairs, 5½. Hind foot, 1.60 inches.

I regret that the only materials at my command for the description of this species consist of some very imperfect skins. In these the only differences from *Pteromys volucella* I can realize are the considerably larger size, and the under hairs of the belly, instead of being white at the roots, are lead colored. The tail is proportionally shorter. In almost every respect, however, the one is a miniature of the other. The upper part of the tail is colored like the back, sometimes with a mixture of darker towards the tip.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.	Nose to—		Tail to end of—		Length of hind ft.	Height of ear.
				Occip.	Tail.	Verteb.	Hairs.		
193	Pembina, Minn.-----	C. Cavileer.-----	Skin.-----	-----	9.00	5.00	5.50	1.60	.65
2033	Halifax, N. S.-----	Dr. J. B. Gilpin.-----	do.-----	1.50	7.00	-----	-----	1.50	-----
2369	-----do.-----	-----do.-----	do.-----	-----	-----	-----	-----	-----	-----
2370	-----do.-----	-----do.-----	do.-----	-----	-----	-----	-----	-----	-----
2823	Steuben, Me.-----	J. D. Parker.-----	do.-----	-----	-----	-----	-----	-----	-----

PTEROMYS ALPINUS.

Rocky Mountain Flying Squirrel.

Pteromys sabrinus, var. β *alpinus*, RICHARDSON, Zool. Jour. III, April 1828, 519.—IB. Fauna Bor. Amer. I, 1829, 195; plate xviii.

Pteromys alpinus, WAGNER, Suppl. Schreb. III, 1843, 230.

AUD. & BACH. N. Am. Quad. III, 1853, 206; plate cxlii, fig. 2.

SP. CH.—Larger than *P. sabrinus*. Flying membrane with a straight border. Tail longer than the body, exclusive of head. (Tail differently colored from the back, and darker?)

There is a flying squirrel in the museum of the Philadelphia Academy of Natural Sciences, labelled "*Pteromys alpinus*, Columbia river, Dr. Townsend," but I am unable to say whether it is really the type of Bachman's description or not. The locality is probably the Rocky mountains, as described by Bachman, nearly all of Townsend's specimens having been labelled Columbia river, whether collected there or on the overland march from St. Louis. It is the largest I have seen, the flying membrane with only a slight angle at the wrist; the tail very broad and full. The colors above are of a yellowish brown, much as in *P. oregonensis*; the tail similarly colored, although described as darker, and but little paler beneath. The under fur is dull whitish; the hairs lead colored at the base.

The characteristics of the *Pteromys alpinus* of Audubon and Bachman consist in the larger size, the tail longer than the body, (exclusive of the head,) and the straight border of the membrane. They also speak of a shorter process on the wrist for the support of the membrane; this process, however, in the Academy's specimen, measures nine-tenths of an inch, or considerably more than in the *P. hudsonius*. The blackish brown tail, referred to as distinct in color from the back, I cannot find, the surfaces of both being very similar. The skin measures $8\frac{1}{2}$ inches to root of tail; the tail is broken.

Richardson at first believed in the existence of the species distinguished as above, and, in fact, described a variety *alpinus*, of *P. sabrinus*. The receipt of additional specimens, however, threw some doubt on the subject in his mind. I have not sufficient data before me to come to any very definite conclusion as to there being two species. I cannot find any characteristic difference in the shape of the membrane in the specimen here described and *P. hudsonius*, while the latter exhibits much the most of a want of uniformity in color of tail and body of the two.

PTEROMYS OREGONENSIS, Bach.

Columbia River Flying Squirrel.

Pteromys oregonensis, BACHMAN, Jour. Acad. Nat. Sc. Phila. VIII, 1839, 101.—In. in Townsend's Narrative, 1839.
AUD. & BACH. N. Am. Quad. I, 1849, 133; plate xv.

SP. CH.—Much larger than *Pteromys volucella*. Tail, with hairs, longer than the body alone; shorter than head and body. Flying membrane very broad, its antero-external corner exhibiting a conspicuous angle. Color above yellowish brown, beneath dull white; the hairs plumbeous at base. Tail becoming more plumbeous towards the tip. Length, 7 inches; tail with hairs, $6\frac{1}{2}$; hind foot, $1\frac{1}{2}$ inches.

This species is about the size of *P. sabrinus*, and considerably exceeds the *P. volucella*. The ears are large, their back thinly coated with hair, their concavity nearly naked. The tail is long, and rather narrow but depressed; the sides nearly parallel; with the hairs, it is about as long as the body, exclusive of the head.

In the only adult specimen I have seen, that described by Bachman, the spur on the fore leg supporting the flying membrane stands out at right angles to the wrist, carrying the membrane to a distance of about an inch and a quarter, (to the margin of the hairs,) when the outline bends abruptly at a right angle, (the corner rounded.) The exterior outlines of the membrane, when extended thus, diverge anteriorly, instead of being nearly parallel.

The color of this species is of a dull yellowish brown above; this color only on the tips of the hairs. The flying membrane above appears chiefly of a brownish plumbeous. The basal fourth of the tail above is colored like the back, and an obscure median stripe of the same extends nearly to the tip; the remainder of the upper surface has a plumbeous cast. The under parts are dull white; the hairs plumbeous at base, and mostly tipped with dirty yellowish brown. The under surface of the tail is nearly uniform light yellowish brown, with a tinge of plumbeous.

Measurements.

	Inches.
To root of tail	7
Tail vertebræ	$5\frac{3}{4}$
, hairs	$6\frac{1}{2}$
Hind foot	$1\frac{1}{2}$
Expanse of flying membrane.....	8

The specimen from which this description is taken is the original of Dr. Bachman's description, and now belonging to the Philadelphia Academy of Natural Sciences. Another specimen collected in California by Dr. Heerman, and presented by him to the Academy, is smaller, with a grayer or more hoary aspect above, though otherwise similar.

Several very young squirrels, probably of this species, were obtained in Washington Territory by Dr. Cooper.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Number of specimen.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.
599	1,722	-----	○	Washington Ter.	1854	Dr. J. G. Cooper ..	Skin.
-----	-----	2	○	do	1854	do	Alcohol.

TAMIAS, Illiger.

Tamias ILLIGER, Prod. Syst. Mam. et Av. 1811, 83.

AUD. & BACH. N. Am. Quad. I, 1849, 64.

Tendis, RAFINESQUE, Am. Month. Mag. I, 1817, 362.

Cheek pouches ample, extending to the occiput. Tail shorter than the body, not bushy. The species with three to five dark dorsal stripes. Permanent upper molars four. The anterior basal plate of the zygoma perforated by a nearly circular foramen.

The genus *Tamias* bears somewhat the same relation to the squirrels that *Spermophilus* or rather *Otospermophilus* does to *Arctomys*. It is composed of a very limited number of species, two of which occur in Europe and Asia and the remaining four or five in North America. All are marked with a median dark dorsal stripe, usually with two others on each side; the intervals between the stripes either of the ground color or lighter.

The cheek pouches are ample in *Tamias*, and are capable of great distension, so as to hold a large supply of food. They open anterior to or alongside the molars, and reach back almost to the shoulder.

The tail is short, less than the body, and the hairs, though longest on the sides, are comparatively short; nor is the tail at all bushy. The feet are large, and the claws well developed, in accordance with the fossorial habits of the species.

The skull is depressed and narrow and tapers anteriorly to the end of the considerably elongated muzzle. The dorsal outline is quite convex. The post orbital processes are slender and styliform. The zygomatic arch is very gently and uniformly curved in its inferior outline from the temporal bone to where it melts into the intermaxillary on the upper part of the snout, instead of having a distinct angular bend upwards just opposite the inferior edge of the zygomatic process of the maxillary. In this character it differs from all other *Sciurinae*. The plane of the zygomatic plate of the maxillary, too, is more oblique to the vertical plane of the axis, and there is a very distinct, nearly circular, foramen perforating the base of this plate, a character entirely peculiar to *Tamias* among the squirrels. The tubercle below the foramen is quite distinct. The permanent molars are only four in number and are quite small. They are quite peculiar in having the plane of the grinding surfaces horizontal anteriorly, then twisting gradually outwards, rendering the crown of the last molar quite oblique. The level of the crown of the last molar, too, is considerably higher than that of the first, the external outline of the alveoli rising behind in a similar manner, so that if produced it would intersect the parietal bone considerably in advance of the occiput. Both outlines of the molar series are gently convex, the anterior molars themselves a little wider apart than the posterior.

The lower molars correspond with the upper ones in the twisting of the plane of the grinding surface and its gradual elevation posteriorly. The lower jaw is much slenderer than in the true squirrels; the coronoid process is narrow, elevated, and much curved. The upper incisors are compressed laterally; as in *Sciurus* the lower have the antero-posterior dimensions much less in proportion.

The skull of *Tamias* exhibits a considerable resemblance in shape to that of the *Tamias*-like *Spermophiles*. It is, however, much more depressed. The anteorbital foramen is in the

zygomatic plate, not anterior to it; the zygoma without an angular bend; molars four, not five; incisors narrow and squirrel-like, &c. From *Sciurus* it is distinguished by the more depressed and elongated skull; the perforation of the zygomatic plate; the great obliquity of the planes of the molars; the straight zygoma; the elevated and lengthened coronoid process of the lower jaw, &c. The notch of the posterior edge of the zygomatic plate of the maxillary is opposite the first anterior molar in *Tamias*, instead of the third as in *Spermophilus*.

TAMIAS STRIATUS.

Chipping, Striped, or Ground Squirrel; Chipmunk.

- Sciurus striatus*, LINNAEUS, Museum Adolphi Frederici Regis, I, 1754, 8. (Based entirely on an American specimen.)—IB. Systema Naturae, (ed. 10th,) I, 1758, 64.—IB. Syst. Nat. (ed. 12th,) I, 1766, 87.
 SCHREBER, Säugthiere, IV, 1792, 791; pl. ccix. (Figure a little altered from Catesby.)
 HARLAN, Fauna Americana, 1825, 183.
 GODMAN, Am. Nat. Hist. II, 1831, 142.
 DEKAY, New York Zool. I, 1842, 62; pl. xvi, fig. 1.
Myoxus striatus, BODDAERT, Elenchus Animalium, I, 1784, 122.
Sciurus striatus americanus, GMELIN, Syst. Nat. I, 1788, 150.
 FISCHER, Synopsis, I, 1829, 348.
Tamias striatus, BAIRD, 11th Rep. Sm. Inst. 1857, p. 55.
 KENNICOTT, Rep. U. S. Pat. Office for 1856, Agricultural, (1857,) 70; pl. viii.
Tamias americana, KÜHL, Beiträge zur Zoologie, 1820, 69. (Specimen in Bullock's Museum.)
Sciurus americanus, FISCHER, Synopsis, 1829, 349. (From preceding.)
Sciurus (Tamias) lysteri, RICHARDSON, F. B. Am. I, 1829, 181; pl. xv.
 DOUGHTY's Cabinet Nat. Hist. I, 1830, 169; pl. xv.
Sciurus lysteri, WAGNER in Schreber Säugt. IV; pl. ccxiv, C. (Figure only.)
Tamias lysteri, SCHINZ, Synopsis Mam. II, 1845, 47.
 AUD. & BACH. N. Am. Quad. I. 1849, 65; pl. viii.
Sciurus a. Cla. Dom. Lyster observatus, RAY, Synopsis Quad., 1693, 216.
The ground squirrel, CATESBY, N. H. Carolinas, II, 1731, 75; pl. lxxv. (In part.)
Ecureuil de Caroline, BRISSON, R. An. (Quadrup.) 1756, 155.
Ground squirrel, PENNANT, Synopsis Quad. 1771, 288.
 CHURCH, Cabinet of Quad. II, 1805; plate.
Striped dormouse, PENNANT, Hist. Quad. 1781, No. 286.—IB. Arctic Zoology, I, 1784, 126. (Specimen in Leverian Museum.)

SP. CH.—Tail to end of the hairs shorter than the body; to end of vertebræ about three-fifths the length of the body. Back and sides with five longitudinal black stripes, which do not extend over the rump; the two outer on each side close together, separated by a white line; the middle or dorsal stripe with a wide interval on each side of a finely grizzled yellowish gray and brown, like that on the upper parts generally. Dark lines bordered with chestnut brown. Rump pale chestnut. Body 5 to 6 inches; tail, with hairs, 4 to 4½ inches; hind foot 1.40 inch.

Description from a freshly-killed specimen, No. 842.—Body rather stout and somewhat depressed. Neck thick, almost as broad as the head. Forehead arched, snout not very acute. Muffle covered with hairs on the upper part, so that no naked skin is visible when the head is viewed from above. The fissure in the upper lip is continued to the shallow furrow separating the nostrils, which are coated with hairs to their very margin, though their septum is naked. The lips are tumid, the mouth opening directly upon the naked palate. Palate with a triangular callosity posterior to the incisors, and behind this are eight transverse ridges, the first three in

a simple curve, the rest in a double curve, (the central portion folded backward,) all of the latter five interrupted in the middle, except the first. Whiskers arranged in five rows parallel with the top of the head, each with about five whiskered hairs, although, in the upper and lower rows, some of the hairs are inconspicuous, being short and white, instead of long and black like the rest. The eye is rather large, the iris measuring three lines; its centre is just midway between the tip of the nose and the posterior margin of the ear. The ear is quite large, narrow, and high, though rounded at the summit. It is coated with short hairs on both sides, except about the meatus and on the portions covered by overlapping.

The anterior extremities have four well developed fingers with claws. The first finger or thumb is seen as a small basal tubercle covered by a broad, flat nail. The third and fourth fingers are longest and nearly equal, (the former rather the longer.) The claw of the second reaches nearly to the base of that of the third; that of the fifth half way between the ultimate and penultimate articulations of the fourth. The palms are entirely smooth and naked, with five large and broad depressed callosities: three about equal at the bases of the 2d and 3d, 3d and 4th, 4th and 5th fingers, respectively, and two occupying the entire posterior part of the palm. These latter are much the longest, and nearly equal. On the hind feet, the three central toes are longest; the claw of the first reaches to the end of the toe of the fifth, and to the penultimate articulation of the second; the claw of the fifth reaches to the base of the fourth claw. The soles are densely hairy from the heel to within one-fourth of the ends of the metatarsals, naked on the remaining portion. There are four large tubercles situated on the end of the metatarsus, between the bases of the toes. There is a slight naked web between all the fingers and toes at their bases.

The tail, including the terminal hairs, is about as long as the body, exclusive of the head. It is cylindrical at the base, but soon becomes depressed and flattened beneath, slightly rounded above; its average width is about three-quarters of an inch, or the distance between the highest lateral stripes on either side of the back.

The fur is moderately soft, intermingled with many scattered longer hairs. There are some long whisker-like hairs in a tuft projecting from the posterior edge of the arm just above the wrist.

Color.—There are five distinct black stripes on the body, one dorsal and two on each side. The latter are in pairs, quite close to each other, with the space between them a little wider than the stripes and nearly pure white; the upper lateral stripe is separated from its fellow on the opposite side by about the width of the head. None of these stripes extend on to the rump or behind the line of the groin, except very obsoletely, the space posterior to this line constituting the region of the rump, being nearly uniform dark chestnut brown, a little lighter on the thighs. Anteriorly these stripes extend to the line of the axillae, the lower dark one shorter than the rest; the central one reaches to between the shoulders. All the dark lines are bordered by a suffusion of quite uniform chestnut brown, which extends a little beyond them and forms a continuation of the dorsal stripe to the top of the head, which is of nearly the same uniform color, mixed with black hairs. The remaining space between the stripes and on the shoulders is occupied by annulated hairs of gray, yellowish and black. The eyelids are pure white, their naked edges and canthi black. The two light stripes and three dark ones on the face of *Tamias* are here indicated very obscurely by a lightening of the prevailing yellowish brown of the side of the head in line with the eyelids, and a darker shade below the lower eyelid and extending under the ear. The whole sides of the body and limbs are of a light yellowish

brown, darker anteriorly, and on the thighs melting into the chestnut described. The whole under parts, with the upper lip, are pure white to the roots of the hair. The internal surface of the ears is grayish white, except on the anterior margin, which, with the external portion, are like the adjacent region. There is a downy white spot at the base of the ears postero-internally.

The prevailing colors of the upper surface of the tail are grayish white and black; of the under surface a uniform light yellowish brown, (darker at the end of the tail,) bordered and tipped, first with black and then grayish white. On flattening the tail above there is seen, first a narrow black line on either side of the skin covering the vertebræ, then a broader one of quite light yellowish brown, then another of black, of nearly equal width, and, finally, a margin of grayish white; towards the tip the subterminal black increases in extent.

The specimen described was a female, with the mammae much developed. Of these there are four pairs: two in the groin, one on the sides, and one behind the axillae. Those on the same side are situated a little closer and closer to each other from before backwards.

The cheek pouches are very large and extend back as far as the shoulder. The opening is wide and situated along the anterior edge of the buccal muscle. The pouches consist of a very thin naked sac, separating the skin from the muscles of the jaws and firmly attached to both; their opening is anterior to the teeth in either jaw.

Fresh measurements of No. 842.

	Inches.	Lines.		Inches.	Lines.
Nose to occiput.....	1	9	Ear, width.....		5½
eye.....		8	Arm, from elbows to end of claws..	1	8½
ear.....	1	5	forefoot to end of claws.....		10
root of tail.....	5	6	longest toe and claw.....		6
end of outstretched hind legs	7	11	longest claw.....		2
Tail, from root to end of vertebræ.	3	8	Leg, from knee joint to end of claws.	2	6
hairs.....	4	7	tibia.....	1	4
Ear, height posteriorly.....		8	hind foot from heel to end of		
anteriorly.....		6	claws.....	1	4½
internally above skull.....		5½	longest claw.....		2
above notch.....		8½	longest toe and claw.....		6½

This species preserves quite a remarkable constancy of character throughout, but little variation being discernible in a large number of specimens. One (1559) from Essex county is considerably grayer, and the black lines of the back have no brownish margin. In a specimen from Washington the chestnut tints are darker than described above. I am told that entirely black varieties are occasionally met with. In the case of the Siberian ground squirrel there appears to be a permanently black variety, known as *Tamias uthensis*.

A simple comparison of skins of the European and American striped squirrels, which I have recently been enabled to make, is sufficient to show the radical difference between the two. The former is the larger animal; the tail is longer, considerably more bushy, and cylindrical.

There are five quite distinct dorsal stripes of brownish black, larger than their yellowish white interspaces, the three central ones reaching to the root of the tail. The dark dorsal lines have no brown borders, but are immediately in contact with the light intermediate lines.¹

After all the comparisons of the *Tamias pallasii* are to be made with *Tamias* 4—*vittatus*, if with any American species. It is not a little remarkable that the Siberian ground squirrel has, until very recently, been without a specific name. As long as the old and new world species were supposed to be the same, they bore in common the name of Linnæus. A simple comparison of specimens, however, was sufficient to show the differences between them; and as the Siberian animal was assumed as the type, a new name was given to the American. The one first imposed was *Tamias americana*, of Kuhl, in 1820; the next was *T. lysteri*, of Richardson. This author quotes Ray as the authority of this name, but it is, in fact, his own—Ray only referring to the species as *Sciurus a Clar. Dom. Lyster observatus*.

In reality, however, the name of *Sciurus striatus* was first based by Linnæus upon an American specimen in the museum of King Frederic Adolphus, of Sweden, and described in the catalogue of his collection, where Linnæus quotes Catesby's figure, and makes no mention of any but an American animal. In the tenth edition of the *Systema Naturae*, however, he gives both America and Siberia as localities of the species.

Finding the Siberian animal thus without a name, I have called it *Tamias pallasii*,² after the eminent naturalist who was the first to give an accurate account of it to the world.

¹ The following is Wagner's comparison (not quite accurate) of the common European and American ground squirrels.—Suppl. Schreber, III, 233 :

1. The American species is a little larger, while the tail is shorter; head and body measuring 6 to 6½ inches, the tail vertebræ 3, and with the hairs, not quite 4 inches. The Siberian has the head and body 5½ inches long, the tail 4¼.

2. In the Siberian species the color of the upper parts is a dirty ochre yellow; in the American, brownish rusty, with much gray intermixed on the back.

3. The Siberian species has five longitudinal black stripes, with the yellow ground color, constituting four intermediate ones. The American has, likewise, the five longitudinal black stripes, but differently arranged; thus, there is one simple vertebral black stripe, and the two lateral on either side are considerably separated from the first mentioned, and so arranged as in fact only to constitute the border of a yellowish stripe which passes between them and runs out to a point at either end. This yellow stripe, however, is not formed by the ground color, as in the Siberian species, but by a different tint altogether. The ground color is only visible between the vertebral line and the dark stripe nearest to it, and this again is not yellow but rusty brown, mixed with gray and yellowish.

4. The central portion of the under surface of the tail, in the Siberian species, is pale clay yellow; in the American, brownish rusty red; in both species, however, with a black and a white hem.

² Eleventh Annual Report of the Smithsonian Institution. May, 1857, p. 55.

List of specimens.

Catalogue number.	Corresponding number of skull.	Age and sex.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									
								Nose to eye.	Nose to ear.	Use to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore fl. length.	Hind fl. length.	Skull, length.	Skull, width.
21			Montreal, Canada.		Thomas Broome.		Skin										
840 ¹	1898	♂	Essex county, N. Y.	Aug. 14, 1855.	S. F. Baird	1	do.			1.75	6.00					1.40	1.56 .87
841 ¹	1899		do.	do.	do.	2	do.			1.75	6.00	3.25	4.25			1.40	
842		♀	do.	do.	do.	3	do.										
843 ¹			do.	Aug. 25, 1855.	do.	17	do.			1.75	6.00	3.50	4.50			1.40	
862			do.	September, 1855.	D. Welch.		do.										
1560	2263		do.	Winter.	Dr. S. E. Hale.		do.										
1559			do.	do.	do.		do.										
2478			Oneida county, N. Y.		H. Davis.		In alcohol.	.76	1.40	1.80	6.08	3.62	4.30	.78	1.40		
2479			Nichols, Tioga county, N. Y.		R. Howell.		do.	.76	1.40	1.80	5.60	3.28	3.84	.88	1.40		
2480			do.		do.		do.	.64	1.27	1.55	4.70	3.10	3.75	.70	1.32		
2481			do.		do.		do.	.75	1.35	1.69	5.20	3.40	3.95	.82	1.41		
2482			do.		do.		do.	.74	1.40	1.74	5.50	3.88	4.39	.80	1.40		
2483			do.		do.		do.	.73	1.38	1.69	5.10	3.30		.75	1.40		
2484			do.		do.		do.	.72	1.40	1.75	5.60	3.78	4.23	.78	1.40		
2485			do.		do.		do.	.68	1.28	1.57	5.70	3.00	3.75	.75	1.35		
2486			do.		do.		do.	.66	1.25	1.60	5.70	3.36	4.10	.80	1.35		
2487			do.		do.		do.	.80	1.50	1.78	5.63	3.34		.74	1.38		
2488			do.		do.		do.	.60	1.20	1.50	3.80	3.35	3.80	.68	1.32		
2051	3091		Washington, D. C.	February, 1857.	do.		Skin									1.55 .88	
644	1795		Racine, Wis.	August, 1853.	S. F. Baird		do.									1.64	
1755			do.		A. C. Barry.		In alcohol.	.70	1.30	1.60	6.00	3.30	3.90	.80	1.38		
500	1644		St. Louis, Mo.		Dr. Geo. Englemann		Skin										
341	1258		Western Missouri.		Dr. P. R. Hoy		Mounted										

Measurement made before skinning.

TAMIAS QUADRIVITTATUS.

Missouri Striped Squirrel.

Sciurus quadrivittatus, SAY, in Long's Exped. R. Mts. II, 1823, 45.

HARLAN, Fauna Americana, 1825, 180.

GRIFFITH, Cuv. V, 1827, 255.

WAGNER, in Schreber's Säugt. IV; plate cciv, A, (from Richardson, no text.)

Sciurus (Tamias) quadrivittatus, RICHARDSON, Zool. Jour. III, 1828, 519.—*IB.* Fauna Bor. Amer. I, 1829, 184; pl. xvi.

FISCHER, Synopsis, 1829, 350.

Tamias quadrivittatus, WAGNER, Suppl. Schreb. III, 1843, 234.

AND. & BACH. N. Am. Quad. I, 1849, 195; pl. xxiv.

Spermophilus quadrivittatus, F. CUVIER, Suppl. Buffon, I, Mammif. 1831, 340.

Tamias minimus, BACHMAN, Jour. Acad. Nat. Sc. Phila. VIII, I, 1839, 71.—*IB.* Townsend's Narrative, 1839, 323.

WAGNER, Wiegmann's Archiv, 1843, II, 44.

SP. CH.—Tail, with the hairs, nearly or quite as long as the body. A grayish white stripe along the top of the head, with branches passing above and below the eye. The stripe bordered above and below by darker ones, and separated behind the eye by a dark line. A gray or hoary patch behind the ears. Sides of body deep ferruginous; back with five about equidistant dark stripes, nearly black on the posterior part of the body, their intervals forming four grayish white lines of similar dimensions to them. Tail when flattened out, ferruginous externally, then black, then ferruginous. Body beneath, dirty grayish white. Length, 4 to 5 inches. Hind foot, 1.20 inch.

A line of grayish white begins above the nostrils, on each side, and runs from the tip of the snout along the edge of the head to near the eye. Here it bifurcates, one branch passing above, the other below the eye, and wider than at first, extend nearly parallel to each other, the lower one to the anterior base of the ear, the upper not so far. The upper and lower margins of this bifurcating line are darker, bordered by rather narrow lines of dark reddish brown, mixed with dark brown; the lower extending to the posterior edge of the ear, or in fact beneath it, where it becomes diffused. The eyelids are black; this color continuous behind with a stripe of dark brown, which separates the light stripe, and changing into reddish brown extends up to the anterior margin of the ear. The dark stripes bordering the upper light ones are confluent on the top of the snout. Top of the head mixed gray, reddish, and brown.

The concavity of the ear, or its inside, is covered with short reddish hairs; of its convexity, the anterior half, with the inflected portion, is dark brownish black, the posterior, grayish white, continuous with a patch of the same half an inch long behind the ear.

A narrow dark dorsal line begins at the occiput and extends to the root of the tail, widening about midway and then contracting towards the end. Another commences on each side of this, just back of the gray patch mentioned above, and widening like the dorsal line, and slightly concave to it, extends likewise to the root of the tail. The sides of the body are broadly reddish brown or fox color, more grayish posteriorly. Anteriorly the upper edge of this color is deeper ferruginous, becoming dark brown, nearly black posteriorly. There are thus five dark stripes on the dorsal surface; the three central ones mixed reddish brown and dark brown on the anterior half of body, then becoming nearly pure blackish brown. They are separated by four grayish white lines of equal width with the dark ones; anteriorly they are mixed with reddish brown, especially the two inner; the outer are nearly pure from above the axillae. The exterior surfaces of the limbs are pale rusty; the body beneath is grayish white, with a tinge of rusty.

The tail above is mixed, ferruginous and black; beneath, uniform ferruginous; of the hairs individually, the extreme base is black, then rusty, black and rusty in nearly equal proportions, the black increasing, however, towards and at the tip.

On the fore foot the second toe, with its claw, is longest; the third, little shorter; the inner next longest, not much exceeding the outer. The thumb is very minute. The three middle hinder toes are longest, the central one a little longer than the rest; the others considerably shorter, with the claws not reaching to the claws of the rest; the outer longer than the inner. (No. 2468.)

In all the specimens from the Upper Missouri and Yellowstone rivers¹ there is a constant difference from the preceding description in the much greater lightness of color. The dark stripes have much less black in them, excepting the central one, which is usually more distinct. They are also smaller and the tail longer. A specimen from the Black Hills (1908) is intermediate in shade between the Yellowstone and the much darker Rocky Mountain specimens, especially 2468 from the Sangre del Cristo Pass, a locality very near that of Say's original specimen.

As previously mentioned, the *Tamias pallasii* of Europe has close relationships to *T. quadrivittatus*, although they are readily distinguished on comparison. The former species is considerably the larger, in fact, fully twice the size, as shown by the accompanying table of measurements.² The tail is fuller and more bushy. The dorsal stripes are more distinctly black and broader, and have no border of brownish, being immediately in contact with the reddish white narrower intervals. There is none of the rusty color of the side seen in *T. quadrivittatus*, this being replaced by a light brownish yellow. The tail is also much lighter colored, the hairs being rusty yellow, tipped with grayish white, and with a broad subterminal annulation of black.

The common chipping squirrel (*Tamias striatus*) is easily distinguished by the fact that the spaces between the two outer dark stripes are alone whitish; those on each side the dorsal line being mixed like the back. The stripes do not reach to the root of the tail; the hind part of the back being dark ferruginous.

¹ "I first saw this sprightly squirrel at the mouth of the Yellowstone, and encountered it frequently in our passage along this river. It is abundant in the Bad Lands, preferring rocky ledges, and living on the leaves and seeds of the common sage, (*Artemisia frigida*? and *tridentata*.) It is occasionally seen about heaps of flood wood along the river. Its movements are much like those of the common ground squirrel, and its note differs only in not being so loud. They never sit and chatter, but give two or three chirps as they run along to their hole."—Dr. F. V. Hayden, in letter, 1855.

Tamias pallasii, (measurements.)

Current number.	Locality.	From tip of nose to—		Tail to end of—		Length of—	
		Occiput.	Tail.	Vertebrae.	Hairs.	Fore foot.	Hind foot.
1971	Siberia.....		5½				1.40
1463	do.....	1.65	6.75	3.30	4.15	.85	1.40

List of specimens.

Catalogue number.	Corresponding Sex & No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—	
							From tip of nose to—				Tail to end of—			Length of—		
							Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.		
1773		Yellowstone river	Sept. 3, 1856	Lt. G. K. Warren		Skin			1.50	3.75	3.00	4.00				Dr. F. V. Hayden.
1774	♂	do	Aug. 10, 1856	do		do									1.15	do
2470		do		Dr. F. V. Hayden		In alcohol	.50	1.07	1.35	4.05	2.95	4.10	.61		1.18	
2471		do		do		do	.50	1.10	1.30	4.10	3.10	4.00	.55		1.20	
2472		do		do		do	.55	1.09	1.26	4.20	3.00	4.50	.60		1.21	
2473		do		do		do	.50	1.10	1.39		3.10		.50		1.20	
1323		Mauvaises Terres	1854	Col. A. Vaughan		Skin										Dr. F. V. Hayden
1322		Fort Sarpy, Yellowstone riv.	Aug., 1854.	do		do									1.15	do
6491		do	1854	do		do	.50		1.33	4.00	3.50	4.50	.60		1.17	do
2475		Mouth of Judith river, Neb.	Aug., 1855.	Dr. F. V. Hayden		In alcohol	.50	1.10	1.34	4.20	3.35		.55		1.20	
2476		do		do		do	.50	1.10	1.35	4.30	3.59	4.40	.50		1.22	
1908	♂	Black Hills, Neb.	Aug. 3, 1856	Lt. F. T. Bryan	198	Skin			1.50	5.00	3.25	4.50			1.20	W. S. Wood.
1907	♂	Pole creek, Neb.	July 29, 1856	do	173	do			2.00	5.36	2.90	3.25			1.15	do
1910	♂	North Platte, Neb.	Aug. 11, 1856	do	247	do			1.50	5.00	3.25	4.25			1.15	do
1919	♂	do	Aug. 21, 1856	do	295	Skin in alcohol			1.25		3.25	4.00				do
2468		Sangre del Cristo Pass		Capt. E. G. Beckwith		Skin				5.00						do
2474		Fort Stanton, N. M.		Dr. T. C. Henry		do										do
944		Blue Mountains, O. T.	Oct. 4, 1854.	Gov. I. I. Stevens	30	do				4.50		4.25			1.20	Dr. Suckley
93*		Oregon, Columbia river		Phil. Acad. Nat. Sciences.		do									1.15	J. K. Townsend
1246		Cascade Mountains, lat 44°		Lt. R. S. Williamson		In alcohol										Dr. J. S. Newberry.
1286	2804	Des Chutes Basin	Sept., 1855.	do		Mounted										do
1287		Upper des Chutes	Aug., 1855.	do		In alcohol										do

* Height of ear, .60.

* Skull 1.25 by .73

* This specimen, though labelled mouth of Columbia river, in all probability was found considerably to the eastward.

Length of skull 1.25 inches.

TAMIAS DORSALIS. Baird.

Gila Striped Squirrel.

Tamias dorsalis, BAIRD, Pr. Acad. Nat. Sc. Phila. VII, April, 1855, 332.

SP. CH.—Sides of head with the usual stripes of *Tamias*, but very distinct and well defined. Above, hoary mixed with rusty and brown; beneath, dull white. Sides and buttocks dull rusty. A single distinct dorsal dark stripe; the others usually seen in the genus being obsolete, except the exterior light stripe, which is somewhat distinct. Tail, with the vertebrae half the length of body; the hairs unusually long, black, and chestnut, largely tipped with white.

Body about five inches; tail sensibly shorter. Hind foot 1.25 inches.

This species is readily distinguishable from all others by the single dorsal stripe, the others being obsolete. The more bushy tail, with its conspicuous markings of chestnut, black, and white, is also highly characteristic of it.

A more detailed description will be found in the report of the United States Mexican Boundary Survey.

List of specimens.

Catalogue Number.	Corresponding No. of skull.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Collected by—
119-20	3151	Fort Webster, Copper Mines of the Mimbres, New Mexico.	1851	Col. J. D. Graham.	Skin-----	J. H. Clark.

TAMIAS TOWNSENDII.

Townsend's Striped Squirrel.

Tamias townsendii, BACHMAN, Jour. Phila. Acad. Nat. Sc. Phila. VIII, 1, 1839, 68.—*Id.* in Townsend's Narrative, 1839, 321.

WAGNER, Wiegmann's Archiv. 1843, II, 44.

AUD. & BACH. N. Am. Quad. I, 1849, 159; pl. xx.

Tamias hindsii, GRAY, Annals & Mag. N. H., X, 1842, 264.—*Id.* Zool. of Sulphur, 1844, 34; plate xiii, fig. 1. (California.)

Tamias cooperii, BAIRD, Pr. Ac. Nat. Sc. Phila. VII, April, 1855, 334.

SP. CH.—Larger than *T. striatus*. Tail, with hairs, nearly or quite as long as the body. Sides of head striped. Above and on the sides rufous brown, with five dark stripes reaching to the tail, the intervals between which are scarcely or but seldom paler than the ground color; beneath, dull white. Ears dusky brown, hoary posteriorly. Tail bright chestnut beneath, margined with ashy white, within which is a band of black. Length 5 to 6 inches. Hind foot 1.40 to 1.50.

Varies in rather paler colors, ash-colored interspaces, and sometimes the back with black hairs interspersed, so as to obscure or nearly conceal the dorsal stripes.

Description of typical specimens from near the mouth of the Columbia river.—In size *T. townsendii* exceeds all other species of *Tamias* in this country. It has the same general characteristics as the rest. The ears are moderate and well coated with hairs, but not tufted. The two middle fingers are longest, the inner longer than the outer; palms naked. On the hind foot, the fourth and third toes are longest, and nearly equal; the second very little shorter; the fifth, or exterior, does not reach the base of the claw of the fourth; the first bears the same relation

¹ "Rufous brown, with three close black streaks, outer-edged with a white streak. Feet rusty brown. Tail hairs red at base, with a black subterminal band. Head and body 5½ inches, tail 4½."

to the fifth. The whole under surface of the metatarsus is hairy, the sole naked from the tubercles. The tail is comparatively long, but shorter than the body.

The sides of the head exhibit the light stripes of the other species. The ears are dusky brown or nearly black, except for the posterior fourth which is hoary, of a color similar to a patch just behind the ears. The general color of the upper parts is of a dark reddish brown mixed with a few black hairs. These hairs are dark lead color, except at the tips, which are plain reddish brown, without annulation, as far as can be detected. Down the back, from occiput to tail, is a well defined stripe of black, on each side of which are two others of less extent. The ground color between these stripes is not appreciably lighter. Beneath, the animal is dull ashy or brownish white, the line of separation between the colors of the under parts and the sides not being distinct. The tail beneath is rather light chestnut, margined all round with grayish white, and with a broad subterminal black border. Examined closely, each hair is black at the base, then chestnut, black, and grayish white. On the upper part and sides of the tail the basal black increases in extent.

A specimen from Shoalwater Bay (2469) is smaller, and differs in the brighter reddish of the back and sides. There is a faint lightening of the interval between the two outer stripes. The colors beneath are clearer and the contiguous tints better defined.

In the variation from the type of coloration, as described for *T. townsendii* by Bachman, observable in certain specimens from Washington Territory, especially Nos. 211 and 212, I characterized these as distinct under the name of *Tamias cooperi*.¹ A much larger series of

¹ The following is the description, as prepared two years ago, with the specimens then before me :

TAMIAS COOPERI.—SP. CH.—Tail vertebrae little more than half the length of body. Ears large. A light stripe along the side of head, bifurcating at the eye. Anterior portion of body above and sides grizzled gray and brownish, or brownish ash, somewhat like the sides of *Mus decumanus*; on the middle of side a slight dash of rusty. Three distinct dorsal glossy dark brown stripes, with two others less marked. The intervals between these light grayish, especially the exterior ones. Beneath grayish white, distinct from the color of the sides. Hairs of the tail dark at the roots, then rusty, then black and tipped with grayish. Size rather larger than *Tamias striatus*.

Body stout; head rather short; ears large; whiskers black, longer than the head. Tail short, scarcely three-fourths the length of the body. Feet rather large; thumb rudimentary; two middle fingers of equal length; inner a little longer than the outer, its claw extending to the base of that of the longest; soles naked. On the hind feet, the first digit or toe is small, only half the length of the longest, or fourth; the third and second are successively very little shorter than the fourth; the claw of the fifth, or exterior, reaches the base of the claw of the latter. The soles appear naked. All the claws are well developed, brown at the base, with light grayish tip.

A broad band of pale yellowish extends from the nose to the eye, where it bifurcates, the branches passing above and below the eye, (where the color becomes lighter,) and extending to the ear. Edge of eyelids black; a dark brown band from the eye to the ear separating the above mentioned light stripes. Above and below the light stripes is a border of dark brown and reddish brown mixed.

The ears are thinly coated with reddish and brown hairs on their concavity; externally they are dark brown; the extreme margin and about one-fourth posteriorly light gray; below the ear a small patch of hoary; less than in *T. quadrivittatus*.

The sides and anterior portion of the back are grizzled brownish ash mixed with light ferruginous, especially on the middle of the body; the exterior surfaces of the limbs are similar. A dark brown, nearly black, dorsal stripe begins on the top of the head, and extends to the base of the tail; on each side of this is a similar stripe, beginning above the shoulders and extending nearly as far; these stripes are separated by the equal intervals of dull grayish ash, and similar but clearer stripes of the same ash are seen on the outside of the last mentioned dark stripes. There is no well defined stripe of darker exterior to these, although the upper edge of the grayish on the sides is dusky, making fainter lines parallel to the others. The dorsal stripe is nearly four lines wide in the middle of the back. The under parts are grayish white, the line of demarcation from the color of the sides being strongly marked.

The hairs of the tail are dusky at base, then light ferruginous, then black, then tipped with gray. Owing to the predominance of black and the gray tips, very little reddish is exhibited above; beneath, however, it is more distinct.

This species is readily distinguished from the *Tamias striatus*, by the entire absence of the bright ferruginous of this

specimens has, however, since convinced me that the differences are perfectly consistent with one and the same species. This view Dr. Cooper himself has all along insisted upon.

The typical condition of the species will then be that of five broad black stripes, with the interspaces of about the same width or a little wider, and colored exactly like the sides and shoulders. There is no margin to the black lines different from the rest of the interspaces. The color of the body, exclusive of the stripes, varies slightly, being sometimes dull reddish brown, grizzled with black, sometimes a bright rusty brownish.

In the other extreme, the interspaces are lighter than the sides and shoulders, and more or less ashy gray; sometimes it is only the external interspace thus colored, and at others the whole four. When not grayish, the rusty brown shade is sometimes lighter than on the sides. These lighter specimens are apparently smaller than the dark ones, which seem confined to the coast, especially the mouth of the Columbia, the others occurring more in the interior.

The gray striped varieties run sometimes very closely into the characters of *Tamias quadrivittatus*, from which, indeed, they are hardly distinguishable, except by the size. They never, perhaps, have the external stripe of as pure white as in this last mentioned species; and the size is considerably larger—the hind foot measuring over 1.30 inches from the heel, while in the *quadrivittatus* this measurement is less than 1.20.

Dr. Cooper suggests that there may be some connexion between the coloration of different specimens of this species, and the localities they inhabit; the dark ones from the mouth of the Columbia living in the dense dark forests, while the grayer ones occupy more open regions more in the interior.

There is still another variety of the western striped squirrel, recently obtained by Mr. Samuels in the redwoods of California, north of Petaluma, in which, owing to the much darker color of the intervals between the stripes, and of the body generally, the stripes themselves are scarcely distinguishable. This obscuration is owing partly to the greater admixture of black hairs among the brown. There is a strong tinge of rusty brown over the whole under parts, which I have not observed in more northern specimens. This variety by the measurements, appears even larger than Astoria specimens, and may possibly prove to be distinct.

There is little necessity of comparing this species with *T. striatus*. From *T. pallasii* it differs in larger body, thinner tail, less approximation and distinctness of the dark lines, the light intervals being larger than the dark lines, instead of narrower, &c.

species; the broad dark stripes extending to the tail, separated by uniform grayish intervals. From *T. quadrivittatus* by the gray (not ferruginous) tips to the hairs on the tail, as well as absence of clear ferruginous generally. The dorsal stripes are broader and darker; the intervals are grayish, not whitish, the anterior three-fourths of the ear is brown, or more than in the other.

The species is stouter than *T. striatus*, the skull broader and the teeth much larger. The small anterior molar (making five) is present.

Compared with a specimen of *T. townsendii* from the Columbia River, brought by Mr. Townsend, many differences are observable. Thus, in *T. townsendii* the ground color of the upper parts and sides is of a nearly uniform dusky yellowish brown, with five well defined black or dark brown stripes on the back; the intervals between these lines are uniform with the rest of the back; the under parts are ash gray, shading gradually into the color of the sides through dusky. The claws of the outer toe on fore foot does not reach to the base of that on the next, as in *T. cooperi*; the chestnut at the base of the caudal hairs is darker. The size is considerably larger and the tail longer in proportion. In *T. cooperi* the light intervals between the lines are grayer than the ground color and the exterior pale ash. The under surfaces are nearly white, and the line of demarcation from the sides very distinct. There is none of the general dusky yellowish brown tint of *T. townsendii*.

Two specimens of this species were procured on the west side of the Cascade range of mountains, in Washington Territory, by Dr. J. G. Cooper.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.							Collected by—		
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore fl., length.		Hind fl., length.	
1301	2236 ⁴	♂	Cape Flattery, Washington Ter.	.....	Lieut. W. P. Trowbridge, U. S. A.	.....	Mounted	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1302			do.	.....	do.	.....	In alcohol	.65	1.35	1.60	5.30	4.70	5.50	.80	1.45	.....	.....
2469			Shoalwater Bay, Wash. Ter.	.....	Governor I. I. Stevens	18	Skin	.....	.....	.....	5.50	.....	.....	.....	.....	.....	Dr. J. G. Cooper
1381		♂	Astoria, Oregon Territory	Aug. 23, 1855	Dr. J. G. Cooper	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
92			do.	.....	Philadelphia A. N. Sc.	.....	Mounted	.....	.....	.....	6.50 ¹	4.25	5.25	.....	1.40	.....	J. K. Townsend
807			do.	.....	Lieut. W. P. Trowbridge, U. S. A.	.....	Skin	.....	.....	.....	6.50 ¹	4.00	5.00	.....	1.25	.....	.....
808			Cascade Mountains, lat. 46°	.....	do.	.....	do.	.....	.....	.....	6.80 ¹	4.30	5.30	.....	1.36	.....	.....
211	1183	.....	do.	July, 1853.	Governor I. I. Stevens	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	Dr. J. G. Cooper
212	1184	.....	Vancouver, Oregon Territory	.....	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	do.
203	1174	.....	Stellacoom, Washington Ter.	July 20, 1853	do.	.....	do.	.....	.....	.....	6.00	.....	4.00	.....	.....	.....	do.
656			do.	.....	Dr. Geo. Suckley, U. S. A.	12	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
657			do.	.....	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1379		♂	do.	June, 1855	Dr. J. G. Cooper	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1380		♂	do.	.....	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1951		♂	do.	March, 1856.	Dr. G. Suckley, U. S. A.	81	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1952		♂	do.	.....	do.	80	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1953		♂	do.	April 20, 1856	do.	91	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1954		♂	do.	April 16, 1856	do.	83	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1955			do.	March, 1856.	do.	82	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2414		♂	do.	.....	do.	.....	In alcohol	.70	1.30	1.60	5.30	4.00	.....	.70	1.50	.....	.....
2415		♂	do.	.....	do.	.....	do.	.70	1.30	1.60	5.20	4.11	4.90	.70	1.30	.....	.....
2416		♂	do.	1856	do.	.....	do.	.70	1.35	1.60	5.40	4.30	5.00	.90	1.40	.....	.....
2417		♂	do.	1856	do.	.....	do.	.50	1.35	1.60	5.00	4.20	4.90	.80	1.35	.....	.....
2418		♂	do.	1856	do.	.....	do.	.65	1.35	1.60	5.30	.....	.....	.80	1.35	.....	.....
2419		♂	do.	1855	do.	.....	do.	.60	1.30	1.50	5.10	4.20	4.70	.80	1.40	.....	.....
2420		♂	do.	1856	do.	.....	do.	.70	1.30	1.55	5.10	.....	.....	.80	1.40	.....	.....
2421		♂	do.	1856	do.	.....	do.	.65	1.30	1.60	5.20	4.30	5.00	.50	1.40	.....	.....
2422		♂	do.	1856	do.	.....	do.	.60	1.30	1.50	4.50	3.85	4.70	.80	1.30	.....	.....
? 8388 ²			Fort Reading, California	.....	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1562	2418	♂	Redwoods, Sonoma county, Cal.	July 30, 1855	Dr. J. F. Hammond, U. S. A.	.....	Skin	.....	.....	.....	1.80	5.25	4.08	5.16	.....	.....	.....
2477			do.	.....	E. Samuels	.....	In alcohol	.73	1.52	1.80	5.60	4.60	5.40	.82	1.50	.....	.....
2409 ³			do.	.....	do.	.....	Skull	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

¹ Probably stretched.² Measurements taken before skinning.³ Skull measures 1.61 by .90 inches.⁴ Skull measures 1.46 by .86 inches.

SPERMOPHILUS, Cuvier.

Spermophilus, F. CUVIER, Mem. Mus. VI, 1822, 293.

AUD. & BACH. N. Am. Quad. I, 1849, 76.

Spermatophilus, WAGLER, Syst. Amph. 1830.*Citillus*, LICHTENSTEIN.

With the general characters of *Arctomyia*. Cheek pouches well developed. Pupils oblong (?). No claw to the thumb, or else very small.

Body more slender than in *Arctomys*; more or less like the squirrels. Ears variable, well developed or quite diminutive, or apparently wanting. External outline of upper molars gently curved; the inner nearly straight and very slightly diverging anteriorly; the anterior and posterior extremities of the line equi-distant. The upper outline of the skull is gently curved; not depressed and plane, as in *Arctomys*; the cranium, too, is narrower and more convex above, and the zygomatic arches less divergent.

The outer toe of the fore foot scarcely reaches to the middle of the sole, (without the nail,) the tip of the outer claw of fore and hind feet does not reach the base of the one adjacent to it. The hairs on the sides of the tail are longer than those above and below.

The genus *Spermophilus*, as above defined, is a very extensive one, and embraces quite a number of subdivisions. Brandt, in the paper above referred to, (page 241,) not improperly divides *Spermophilus* into two sub-genera, *Colobotis* and *Otospermophilus*. The first includes all the European species, and resembles most closely the true marmots; the latter coming nearest to the squirrels, in particular to *Tamias*. Erecting the prairie dogs into a distinct genus would leave the typical *Spermophili*—species with very short tails and ears and naked soles—entirely Old World, such as *S. fulvus*, *rufescens*, *erythrogenys*, *mugosaricus*, and *musicus*, inhabitants chiefly of the Ural Mountains. The *Citilli*, or species with short tails, distinct ears and soles, hairy on the heel and behind the base of the toes, include *S. citillus* and *guttatus* in Europe, and possibly *S. townsendii*, in America; an intermediate group, consisting of species with tails longer than either of the above, embraces two species, *S. parryi*, Rich., and *S. eversmanni*, Brandt; of these the former is abundant in Kamtschatka and the islands of Kadjac and Arikamitchichi, and is likewise found in Arctic America, whence it was first described. If the same species be really found in both continents it will be the only instance known of a Rodent indigenous to the Old World and the New, excepting, perhaps, the muskrat, *Fiber zibethicus*, which by some authors is stated to occur abundantly in northeastern Asia, although this is strongly contested by others.

The great body of North American spermophiles again belong to Brandt's section *Otospermophilus*, with moderate or very distinct ears; tail resembling that of the squirrels, and, in fact, only distinguishable externally by the cheek pouches. None of the otospermophiles are found in the Old World, and this fact, in connexion with the other differences, is quite sufficient, in my mind, to warrant the permanent establishment of Dr. Brandt's genus.

The characteristics of the subdivisions of *Spermophilus*, as given by Brandt, are as follows:

1. COLOBOTIS, Brandt.—First upper molar one-half or less than one-half the size of the second; sub-trilobed or quadrilobed and with the edge compressed, transverse, sub-oblique, tolerably broad, truncate. Second, third, and fourth upper molars with the crowns cuneate-triangular, compressed on the inner face, considerably narrowed and acuminate. Central ridges sub-equal in length, tolerably elevated, parallel on the outer margin of the crown, on the inner, however, approximating at a more or less acute angle. Ears truncate or sub-trun-

cate—very short, sometimes almost marginiform. Soles naked or hairy from behind the base of the toes to the heel, or hairy only at the heel.

The sub-genus, as thus characterized, is divided by Brandt as follows:

Division A.—Soles in the adult entirely naked, with stiffish hairs on the sides of the heel only, margined and partly concealed by these incumbent hairs. Ears submarginiform truncate. Tail moderate or short, about equal to the hind foot.

Species.—*S. fulvus*, *rufescens*, *erythrogegnys*, *brevicauda*, *mugosaricus*, *musicus*.

No species of this type are found in America.

Division B.—Soles in the adult more or less largely pilose. Ears very short, but much wider than in the preceding section. Tail elongated, two or three times longer than the hind foot, and, with the hair, about half the length of the body.

The species of this division, as already stated, are *S. parryi* and *S. eversmannii*.

Division C.—Soles in the adult hairy, both behind the toes and on the heel. Ears short, but distinctly margined. Tail moderate or sub-moderate, one-fourth to one-third the length of the body.

The species are *S. guttatus*, *S. citillus*, and probably *S. townsendii*.

In reference to the pilose condition of the soles, Brandt remarks, that it is necessary to have adult specimens, as the soles may be distinctly hairy in the young and perfectly smooth in adults of the same species.

2. OTOSPERMOPHILUS, Brandt.—The first upper molar about one-third less than the second; conical acuminate, behind truncated a little obliquely and indented by a slight fossa. Crowns of the second, third, and fourth molars nearly rhomboidal, slightly narrowed on the inner face, sub-semilunar, and rounded. Triturating surface with the central ridges slightly elevated, sub-parallel, unequal in length, anterior one longest, posterior indented in the inner limb. Ears moderate or sub-moderate, about one-third the length of the head. Tail elongated. Soles pilose behind the toes. This section is entirely American.

In regard to the pilose condition of the soles, I find that the variation in the same species is not as much with age as mentioned by Brandt, as with season, and that any characters based on this feature are likely to be very uncertain. Throughout the eared spermophiles, the sole is almost invariably naked from the heel in summer, and coated with hairs nearly to the bases of the toes in winter. A few species of the other American species have a small tuft of hair on the soles the year round, but the amount of this varies with the season in all. The same thing takes place in all the North American squirrels.

The following synopsis may serve to facilitate the determination of the North American spermophiles:

A.—OTOSPERMOPHILUS, Brandt.

Ears prominent, as much so as in many squirrels or *Tamias*. Tail squirrel-like, half as long as the body, or longer; sometimes quite full and bushy. Thumb armed with a flat nail only, not a claw. Soles naked in summer; densely covered with short, close, velvety hairs in winter.

1st. Tail (including the hairs) more than half the length of the body (about two-thirds).

1. Body finely mottled above. A broad hoary white patch on the sides of neck and shoulders, the upper edge extending back in a narrow line for a short distance on the sides. Interval between these patches mottled like the hinder part of the back.....

beecheyi.

2. Similar to the preceding. The interval between the hoary patches dark brown, nearly black..... *douglasii*.
3. Above, finely-grizzled gray and black. Anterior half of the body of a pure hoary gray cast; posterior half with a strong wash of yellowish, in marked contrast..... *grammurus*.
4. Color entirely black..... *couchii*.

2d. Tail about half the length of the body.

5. On each side of the back two black lines, separated by a white one of about equal diameter. Middle of back finely grizzled, without any line..... *lateralis*.

B.—COLOBOTIS, Brandt.

Ears apparently wanting, or with the auricle very slightly developed. Tail either very short or half as long as the body, or a little longer; narrow and slender. Soles usually more or less pilose throughout the year. Thumb armed with a distinct sharp claw, (not a nail,) though sometimes quite small.

1st. Ears rather short, but with a small, pointed, and perfectly distinct auricle. Tail half as long as the body. Soles pilose in summer.

6. A distinct white stripe on each side, without any margin of black..... *harrisii*.
7. Mottled yellowish gray and brown. Head pure gray, without any tinge of yellowish *franklinii*.

2d. Ears very short, apparently wanting, in the dried skin. Tail variable in size and length of hair.

8. Tail very long, nearly equal to the body, exclusive of the head; cylindrical. Color yellowish brown, finely pointed with black. No blotches or spots... *tereticaudus*.
9. Tail about two-thirds the length of head and body; flattened; well haired, though narrow. Above, with continuous lines of yellowish, alternating closely with lines of spots of the same color..... *tridecem-lineatus*.
10. Tail as in the preceding. Above, olivaceous brown, with lines of very distinct light spots only, these arranged in regular series..... *mexicanus*.
11. Tail somewhat as in preceding. Above, yellowish chestnut, with numerous more obsolete light blotches, not distinctly arranged in series, most conspicuous on the posterior portion of the back..... *spilosoma*.
12. Tail rather full; nearly half as long as the body. Above, with crowded indistinct subquadrate light spots. Top of the head chestnut..... *parryi*.
13. Tail narrower; one-third the body. Body uniform yellowish brown, without any spots, blotches, or stripes whatever..... *richardsonii*.
14. Tail very slender; cylindrical; length one-fourth the body. Above, with numerous crowded obsolete, light, rounded spots or blotches..... *townsendii*.

SPERMOPHILUS BEECHEYI.

California Ground Squirrel.

Arctomys (Spermophilus) beecheyi, RICHARDSON, Fauna Boreali-Americana I, 1829, 170; plate xii, B.

Arctomys beecheyi, WAGNER, in Schreber, Säugt. IV; plate ccc, E. (Interpolated. No text.)

Spermophilus beecheyi, F. CUVIER, Suppl. Buffon, I, Mamm. 1831, 331.

BAIRD, Pr. A. N. Sc. Phil. VII, 1855, 334.

Otospermophilus beecheyi, BRANDT, Bull. Phy. Math. Acad. St. Petersb. II, 1844, 379.

? *Sciurus (Macrozys) californicus*, LESSON, Desc. des Mammif. et d'Ois. 1847, 143.

? ? *Sciurus bottae*, LESSON, Cent. Zool. 1830, 221; plate lxxvi.

SP. CH.—Size of the cat squirrel, *S. cinereus*. Ears large, prominent. Tail more than two-thirds as long as the body. Above, mixed black, yellowish brown, and brown in indistinct mottlings; beneath, pale yellowish brown. Sides of head and neck, hoary yellowish, more or less lined with black, a more distinct stripe of the same, from behind the ears on each side, extending above the shoulders to the middle of the body. Ears black on their inner face. Dorsal space between the stripes scarcely darker than the rest of the back. Length, 9 to 11 inches; tail, with hairs, 7 to 9. Hind feet, 2 to 2.30 inches.

Size about that of the *Sciurus carolinensis*, or a little larger. Body rather slender. Head acute. Ears prominent, acute, covered on both sides with flattened hairs, those on the superior extremity projecting nearly a quarter of an inch in a scant flattened brush. Whiskers as long as the head. Tail nearly as long as the body in some specimens, shorter in others, flattened and well clothed with hairs, although not bushy, except on the under side, where they are very sparse. The claws are all black, lighter at tip; the under surface of the soles sparsely haired. The first finger, or thumb, is rudimentary, with a blunt nail; the third, longest; the second and fourth nearly equal. On the hind feet the three central toes are nearly equal and longest, the outer longer than the inner.

The fur generally is coarse, thin, stiff and short. The prevailing tint of the upper parts and sides of the body is a mixed black and light yellowish brown (with some darker brown); on the top of the head the latter tint predominates. The sides of the head and neck, the eyelids, and a patch or stripe extending on each side from behind the ear to about the middle of the body are of a yellowish hoary, not uniform. The exterior face and posterior edges of the ears are pale yellowish brown; the inner face with the projecting hairs are black. The under and inner parts are uniform pale brownish yellow. On the back the hoary patches are distinctly separated by the prevailing tint of the upper surfaces in a stripe about one-third of an inch broad at first, then rapidly widening, but throughout like the hind part of the back in color. The hairs are everywhere dark brown at the base for most of their length above, about half of it beneath, where there is a slight tinge of lead color. The terminal portion of the dorsal hairs is of the light yellowish brown, as described, with a short black tip. The mottling is produced by the varying exhibition of the two colors. Viewed from beneath, the tail exhibits on each side (when stretched out) a ground color of a yellowish brown, similar to the lighter shades on the back, and three black lines, the outer one broadest and subterminal. On the upper surface of the tail these colors are more blended together.

Measurement of skulls.

Number.	Locality	Length.	Width.
2184	Gila river.....	2. 21	1. 31
936	California	2. 31	1. 51
1598	Fort Tejon	2. 15	1. 28

A young specimen from Fort Reading is rather darker than usual on the back, and may possibly belong to *S. douglassii*. On account of the locality, however, I have entered it among the present species.

The reception of many additional specimens, since the preceding description was written, substantiate the permanence of character as given above in the California animal, and as distinguished from the *S. douglassii*. These vary in the amount of hoary on the shoulders, but in none is the back darker than the ground color, and unbroken by mottling. The soles vary from entirely naked in summer skins, except immediately at the heel, to densely hairy to the tubercles in winter ones. Only in the latitude of San Diego do the soles appear to remain nearly naked throughout the year.

This species was not recognized by Audubon and Bachman as any thing more than a variety of *Spermophilus douglassii*. Even should this be the case, its name must take precedence of the last named species, on account of having been published first in the pages of the Fauna Boreali-Americana.

This is the animal so well known in California, under the name of ground squirrel, as causing so much damage to the farmer by the depredations it commits on grain fields and, in fact, almost every agricultural product, as well as by the disturbances of the soil by its excavations.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.							Collected by—		
								From tip of nose to—				Tail to end of—		Length of hind ft.		Height of ear.	
								Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.				
.....	?2184	.....	Gila river.....	.....	Dr. Antisell.....	.....	Skull....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
493			San Diego, Cal...	.....	Lt. Trowbridge....	.....	Skin....	.....	.....	.....	.....	5.75	7.00	2.08	.....	A. Cassidy .....	.....
1597			do.....	.....	Dr. J. F. Hammond	.....	do.....	.....	.....	11.25	.....	8.00	2.10	.....	.....	.....	.....
1598		♂	do.....	Dec. 29, 1855	do.....	.....	do.....	.....	.....	.....	5.12	6.50	1.93	.....	.....	.....	.....
1599		♂	do.....	do.....	do.....	.....	do.....	.....	.....	11.50	.....	7.50	.....	.....	.....	.....	.....
1600		♀	do.....	Dec. 28, 1855	do.....	.....	do.....	.....	.....	.....	5.50	6.75	2.10	.....	.....	.....	.....
468	7599	.....	Tejon Valley, Cal.	.....	Lt. R. S. Williamson	B	Mounted.	.....	.....	.....	7.25	8.62	2.10	.....	.....	Dr. Heermann...	.....
467	1398	.....	do.....	.....	do.....	A	do.....	.....	.....	.....	5.25	.....	2.01	.....	.....	do.....	.....
469			do.....	.....	do.....	.....	do.....	.....	.....	.....	7.00	8.75	2.15	.....	.....	do.....	.....
470			do.....	.....	do.....	.....	do.....	.....	.....	10.75	8.12	9.75	2.30	.....	.83	do.....	.....
494			Monterey, Cal. ..	.....	Lt. W. P. Trowbridge	.....	Skin....	.....	.....	.....	6.75	8.00	2.06	.....	.....	.....	.....
1181			Santa Clara, Cal.	.....	Dr. J. G. Cooper...	.....	do.....	.....	.....	10.00	.....	7.00	2.10	.....	.....	.....	.....
2384			do.....	.....	do.....	.....	do.....	.....	.....	.....	4.62	5.87	2.05	.....	.....	.....	.....
608			San Francisco....	.....	R. D. Cutts .....	.....	do.....	.....	.....	.....	6.10	7.40	2.10	.....	.....	.....	.....
506			do.....	.....	do.....	.....	do.....	.....	.....	.....	5.30	7.00	2.34	.....	.....	.....	.....
433			California .....	.....	Philada. A. N. S...	.....	Mounted.	.....	.....	.....	5.87	7.50	2.38	.....	.....	Col. G. A. McCall.	.....
?865		♂	Fort Reading, Cal.	.....	Dr. J. F. Hammond	.....	Skin....	.....	.....	.....	3.75	4.38	1.65	.....	.....	.....	.....
?2492		♂	do.....	.....	do.....	.....	In alc. ..	.88	1.75	2.15	6.30	4.08	.....	2.00	.....	.....	.....

SPERMOPHILUS DOUGLASSII.

Columbia Ground Squirrel.

Arctomys Spermophilus douglassii, RICH. F. B. A. I, 1829, 172.

Spermophilus douglassii, F. CUVIER, Suppl. Buff. I, Mamm. 1831, 333.

WAGNER, Suppl. Schreb. III, 1843, 247.

Spermophilus douglassii, AUD. and BACH. N. Am. Quad. I, 1849, 373; pl. xlix.

Otospermophilus douglassii, BRANDT, Bull. Phys. Math. Acad. St. Pet. II, 1844, 380.

SP. CH.—Similar in most all respects to *S. beecheyi*, but with the space on the nape and back, between the light colored more lateral patches, of a uniform dark brown, nearly black.

A sphermophile from the Columbia river differs from the *S. beecheyi*, as described from California, in some important points, the comparison being with six specimens from the latter locality. The tail is shorter and much less bushy, the hairs being laid quite close down, as in the small spermophiles, instead of approximating to the bushy form of the squirrels. The under side of the tail is more densely haired. It is more hoary above and below, and the hairs show conspicuously only a distinct ring of black near the base and the hoary tip; the intermediate dark rings being very faint. The hoary marks on the sides of the neck and shoulders show much more gray than the other species, while the stripe between, instead of being nearly uniform in tint with the posterior portion of the back, is darker than this anteriorly, and in its wider posterior half is uniformly and conspicuously brownish black without any mottling. The hoary patch likewise extends more broadly posteriorly, covering a wide space, instead of being reduced to a narrow line behind the shoulder. The patch on the inner face of the ear is more restricted. The feet and claws appear longer in proportion.

Additional specimens received from Oregon, since the preceding description was prepared, substantiate the characters assigned as distinguishing a northern species. The tails of these, however, are less compressed, and more like those of *S. beecheyi*, though apparently less ample. The ears do not appear so black. The soles vary from being entirely naked except on the heel in summer, to densely hairy to near the digital tubercles in winter.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.					
								From tip of nose to tail.	Tail to end of—		Length of hind ft.	Skull.	
									Verteb.	Hairs.		Length.	Width.
1005		♂	Fort Dalles, O. T.....	Jan. 24, 1855	Dr. G. Suckley, U. S. A.	39	Skin	12.00 ¹	8.25 ¹	9.50 ¹	2.00	.....	.....
999		♂	do.....	April 7, 1855	do.....	52	do....	10.50 ¹	7.25 ¹	9.25 ¹	.....	.....	.....
90			Columbia river.....	.....	Phila. A. N. Sc.....	.....	Mounted.	.....	.....	.....	.....	.....	.....
755	1881	.....	Near Columbia river...	.....	Dr. J. Evans.....	.....	Skin ....	.....	.....	.....	.....	2.47	1.51
1180			Klamath lake, O. T....	.....	Lieut. R. S. Williamson, U. S. A.	.....	....do....	.....	6 25	8.00	.....	.....	.....

¹ Measured before skinning.

SPERMOPHILUS GRAMMURUS.

Line-tailed Squirrel.

Sciurus grammurus, SAY, Long's Exped. R. Mts. II, 1823, 72.

HARLAN, F. Am. 1825, 182.

GRIFFITH, Cuv. V, 1827, 255.

FISCHER, Synopsis, 1829, 350.

Spermophilus grammurus, BACHMAN, Charles. Mag. N. H. III, 1839, 390.

WAGNER, Suppl. Schreb. III, 1843, 253.

BAIRD, Pr. A. N. Sc. Phila. VII, 1855, 334.

SP. CH.—Body thick, clumsy; about the size of *Sciurus cinereus*; vertebrae of tail about three-fifths of length of the body. Ears broad and high. Palms and soles entirely smooth. General color above gray, produced by a mixture of black and white, purest across the shoulders; rather less so on the sides; posterior half of the upper portion of the back, having the white replaced by pale yellowish brown. Tail grayish white, with three black lines on each side. Body about 12 inches; tail with hairs 9. Hind feet 2.25.

Body thick and clumsy, about the size and proportions of *Sciurus cinereus*. Tail not three-fourths the length of body. Head broad. Ears prominent, broad and high, covered with short hairs on both sides, scattered hairs of greater length projecting above the margin. Limbs and feet rather short. Thumb rudimentary; third finger longest; second a little shorter than fourth. Claw of the fifth reaching to base of the claw of fourth. Fourth toe longest; third and second slightly shorter; claw of first reaches to end of toe (without claw) of fifth. Nails all black, moderately curved. Palms and soles entirely naked. Tail rather long, well clothed with stiff long hair, more sparsely on the under surface; hair everywhere stiff, though moderately long.

The anterior half of the body, above and on the sides, is of a rather pure black and white mixed, the subterminal portion being grayish white; the basal and terminal black. The basal fur above is black, laterally it is of a bluish ash. On the posterior half of the body the white is replaced by pale yellowish brown, and the black by a dark brown. On the sides the colors are purer, the hairs becoming lighter at the base in passing down the sides and to the root of the tail.

The under parts are of a pale fulvous white, changing into pale brownish yellow anteriorly, posteriorly, and on the inner faces of the limbs, the hairs being everywhere brown at the base, except on the last mentioned region. The top and sides of the head are grayish white and black, mixed, the latter predominating. The eyelids are white; the exterior surface of the ear is brownish yellow, as is the posterior border of the inner surface; the remainder is dark brown.

The tail is white and black, the former predominating and constituting rather a broad border all round; there are three distinct rings of black, the outer and sub-terminal one broadest. In some specimens the white appears more or less soiled.

Specimens collected at the Copper Mines by Mr. Clark, of the United States and Mexican Boundary Survey, are larger, (body 13 inches,) but in an imperfect pelage. In these there are a strong tinge of chestnut about the jaw and the edges of the feet.

A specimen (No. 89) from "the Columbia River, Oregon," collected by Mr. J. K. Townsend, agrees with the above in every respect, and is probably referred to by Aud. & Bach. as the female *Spermophilus douglassi*, in which the hoary stripes are obsolete. The distinctions from *S. douglassi* and *S. beecheyi* are well marked, consisting in the much larger and heavier body, shorter tail, shorter inner toe, more curved nails, smooth soles, and general arrangement of

color. This specimen was probably collected in the South Pass, however, as there is no evidence of the existence of the species west of the Rocky Mountains, and it is well known that Townsend's specimens were not all labelled with critical accuracy.

The species was first described by Say, in Long's Narrative, from a specimen taken in July on Purgatory Creek, a tributary of the Arkansas, near Bent's Fort, about latitude $37^{\circ} 32'$, longitude $103^{\circ} 30'$. It has not been since known until its re-discovery by recent government expeditions, for which reason no mention is made of it by Audubon & Bachman.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Measurements.						Collected by—
							Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Hind ft., length.	Skull, length.	Skull, width.	
519	1653	○	Llano Estacado? Western Texas.....		Capt. J. Pope, U. S. A....	Skin							
2638			Fort Stanton		Dr. T. C. Henry, U. S. A...								
125	1111		Ft. Webster, Coppermines		Col. J. D. Graham		13.00	7.87	8.75	2.30	2.50	1.57	J. H. Clark
126	1112		(N. M.)		do						2.52	1.65	do.....
495			do		Dr. T. C. Henry, U. S. A...		10.50	6.00					
496			do		do			6.25	8.40	2.10			
497			New Mexico.....		Dr. T. H. Webb....								
1046?	2215		Los Nogales, Sonora...	June, 1855	Maj. W. H. Emory, U.S.A.	Mounted.....	8.00	9.50	2.20	2.51	1.59		Dr. C. B. Kennerly.

SPERMOPHILUS COUCHII, Baird.

Black Ground Squirrel.

Spermophilus couchii, BAIRD, Pr. A. N. So. Phila. April, 1855, 332.

SP. CH.—Ears prominent; tail cylindrical, full, about two-thirds the length of the body. Color entirely of a glossy black. Length of body, 10 inches; tail, $6\frac{3}{4}$; hind foot, 2 inches.

This species is nearly the size of the black squirrel of Ohio, which it also greatly resembles in color. Its form is much like that of *S. beecheyi*, though the tail is shorter. The ears are quite large, thin, and squirrel-like, as in the last mentioned species; they are uniformly covered on both sides with short hairs. The thumb is armed with a short, broad, blunt nail, not claw. The claws are well developed and strong, as in the genus, and moderately curved. The soles are naked. The tail is about two-thirds the length of the body, and quite uniformly and densely coated with stiff coarse hair as on the rest of the body.

Color everywhere a uniform glossy black, without any other marking on the hairs, except a little white about the edges of the mouth; most lustrous on the tail. There is a little grayish at the bases of some of the caudal hairs.

Although the species is unquestionably a spermophile, it approaches the squirrels still closer than the *S. beecheyi* and *douglassii*, and would be considered a squirrel but for the large, strong, fossorial claws, and the characters of its skull and teeth. I take great pleasure in dedicating it to Lieutenant Couch, its first discoverer.

The collection of Dr. Berlandier contains several heads of this species collected at Victoria, Mex.

This species, in some respects, resembles the *Sciurus mustelinus* of Audubon and Bachman, but is of a different genus, if these authors are correct in ascribing it to *Sciurus*.

List of specimens.

Catalogue number.	Number of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.										Collected by. -
							Nose to occiput.	Nose to tail.		Tail to end of verteb.	Tail to end of hairs.	Fore claw, length.	Hind foot, length.	Hind claw, length.	Skull, length.	Skull, width.	
1255	1255	Santa Catarina, N. Leon.	Apr., 1853	Lt. D. N. Couch.	190	Mounted.	2.25	10.00	5.50	6.67	.33	2.08	.33	.....	1.40	Dr. Berlandier.	
1422	1422	Victoria, Tamaulipas.	.....	..... do.....	.....	Skull....	.....	.....	.....	.....	.....	.....	.....	2.39	1.48		

SPERMOPHILUS LATERALIS.

Say's Squirrel.

Sciurus lateralis, SAY, Long's Exped. R. Mts. II, 1823, 46. (Arkansas river, lat. 38°.25; long. 105°.20; July 16.)

HARLAN, Fauna Amer. 1825, 181.

FISCHER, Synopsis, 1829, 350.

GODMAN, Am. Nat. Hist. II, 144.

GRIFFITH, Cuvier, V, 1827, 255.

WAGNER, in Schreber Säugt. IV; pl. ccxiv, B. (No text.)

Arctomys (Spermophilus) lateralis, RICH, Zool. Jour. III, April, 1828, 519.—In. Fauna Boreali-Americana, I, 1829, 174; pl. xiii.

Spermophilus lateralis, F. CUV. Suppl. Buffon, I, Mam. I, 1831, 335.

WAGNER, Suppl. Schreber Säugt. III, 1843, 252.

AUD. & BACH. N. Am. Quad. III, 1853, 62; pl. cxiv.

Otospermophilus lateralis, BRANDT, Bull. Phys. Math. Acad. St. Petersb. II, 1844, 379.

GIEBEL, Säugt. 1855, 638.

Sp. Ch.—Ears conspicuous; high. Tail, with hairs, more than half as long as head and body; depressed. Middle region of the back finely grizzled yellowish gray and black, without any lines; on each side two distinct black stripes, enclosing a yellowish white one, all of about the same diameter. Posterior half of the thigh and rump dark chestnut brown, without stripes. Top of the head chestnut. Under surface of tail bright chestnut; margined with brownish yellow, within which is a black band. Length about 7 inches; tail, with hairs, about 4; hind foot, from heel, 1.42 inches.

This animal is about the size of the small red squirrel, (*Sciurus hudsonius*) or perhaps less, and in general appearance bears a strong resemblance to *Tamias*. The ears are quite broad and high, rounded at tip, and thin, fully equal in size to those of *Tamias striatus*; they are coated on both sides with short close hairs. The fore claws are but little longer than the hinder ones, and are stouter at the base and more curved than usual among spermophiles. The thumb is obsolete, and provided with a short, broad nail, not a claw. The soles are entirely naked from the heel. The tail is short; the vertebral portion about half as long as the head and body; it is rather broad and flattened.

The most conspicuous feature of coloration consists in two broad stripes of black on each side of the back, with a yellowish white line of equal width between each pair. These stripes extend from the shoulders to the thighs, although there is an obsolete continuation of the light line to the base of the ear. There is no line on the median region of the back, this being of a finely grizzled yellowish and black. In the middle of the back this grizzled dorsal region is

not twice as wide as each adjacent black stripe. The whole rump and posterior half of the thighs are of a dark chestnut brown, slightly mottled with yellowish and black, especially anteriorly, where it runs into the colors of the dorsal region, already described. The sides below the inferior black stripe, and under parts generally, are light brownish yellow, brightest on the sides of the fore limbs and anterior half of the thighs. The top of the head is chestnut colored, the sides are rusty yellow, with a lighter ring round the eye.

The under surface of the tail is a bright chestnut, with a black border, margined externally with brownish yellow. Above it is mixed, black and yellowish, the former preponderating.

A second specimen of this species (1911) is considerably smaller, and probably immature. The grizzled portion of the back is wider, the black stripes narrower and less conspicuous. The chestnut of the top of the head and on the rump are scarcely appreciable. The ring round the eye is much lighter.

This species bears a closer resemblance to *Spermophilus harrisi* than to any other American species, but is sufficiently distinct; the principal points of difference are mentioned in the article on the latter species. In fact they belong to entirely different sections of the genus.

It may be proper to state, that in number 1272 the head and body belong to two different animals.

List of specimens.

Catalogue number.	Number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.							Collected by—	
								Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Hind foot, length.	Skull, length.	Skull, width.		Height of ear.
1272	2228	...	Upper des Chutes, O. T.	Sept., 1855	Lt. R. S. Williamson.	....	Mounted.	.....	7.50	3.00	4.25	1.42	1.63	1.01	.35	Dr. J. S. Newberry.
1911	.....	o?	Medicine Bow Creek, Neb.	Aug. 7, 1856	Lt. F. T. Bryan..	221	Skin.....	2.00	5.25	2.63	3.25	1.42	.....	.....	.30	W. S. Wood.

SPERMOPHILUS HARRISII, Aud. & Bach.

Harris' Squirrel.

Spermophilus harrisi, AUD. & BACH. N. AM. QUAD. III, 1854, 267; pl. cliv, fig. 1.

Size rather less than that of *Tamias striatus*. Tail vertebrae about half the length of the body. Ears short, pointed. Soles hairy. Above, finely grizzled grayish, or whitish brown and black; under parts, and a stripe on each side, (without any black or dusky border,) whitish. Tail with one black and one light line, within the marginal whitish, black in the centre; uniform whitish beneath. Length, 5 inches; tail, with hairs, about 3. Hind foot, 1.45.

This beautiful species of *Spermophilus* is about the size of the common ground squirrel, *Tamias striatus*, or even less, being the smallest yet described from North America. The head is large and moderately acute. The ears are low but prominent, and more acute than in *S. 13-lineatus* and *mexicanus*. The claws are long, considerably curved, and sharp, as in the squirrels. The thumb is provided with a stout nail, scarcely to be called a claw. The third claw is longest, the fourth but little shorter; the second reaching the middle of the third; the fifth to the base of the fourth. The three central claws of the hind foot are about equal, as are the first and

fifth, which extend to the base of those adjacent to them. The soles are densely furred to the base of the toes. The tail vertebræ are rather more than half the length of the body, the hairs flattened out, so that the outlines are nearly parallel.

The upper parts generally are of a finely grizzled yellowish gray, brown and black, the color purer on the anterior portion of the back ; under parts, including the tail, sides of the head, ring around the eye, and a distinct stripe on each side from the shoulders to the hips very pale brownish white ; near the outside of the shoulder, arms, and legs of a pale chestnut, this color tinging the grizzled sides below the light stripe ; the hairs on the thighs with paler tips and and some long black hairs interspersed. The tail is very pale brownish white externally, then black, then white as before, and finally black on the central line ; each lateral hair, therefore, having the base and sub-terminal bar black, the margin and sub-basal bar white. All the lateral hairs have a very narrow tip of black, scarcely appreciable. The whole under surface shows a uniform whitish, the concealed bases only being dusky, the basal third above is like the back. The hairs on the upper part of the body are dark plumbeous at the extreme base, then silky white for the greater part of their length, then brown passing into black, and finally tipped with the whitish as described ; interspersed are many hairs entirely black. Under the light lateral stripes, the hairs are without the dusky at the terminal portion, or only lead color and whitish. The hairs on the under parts are all plumbeous at base.

A second specimen, in alcohol, of this rare spermophile was received from J. G. Bell, Esq., who was unable to give its locality with precision, but supposed it to be from Wisconsin, as it came in company with a skin of *S. franklini*, labelled as from that State.

This species is readily distinguishable from *Spermophilus lateralis* by the much smaller and lower ears, smaller size, entire absence of a dusky margin to the light lateral stripe, &c.

Harris' spermophile was first described by Audubon and Bachman from a specimen presented to them by J. R. Townsend, without any indication of locality. This was first accurately ascertained by Dr. Heermann.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—
							Nose to occip.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length, fore foot.	Length, hind foot.	Ears, above notch.	Ears, above skull.	Tail, breadth of.	
471	1600	Mohave desert	1853	Lt. R. S. Williamson	3	Mounted...	1.50	5.00	2.25	2.92	....	1.33	.33	.09	.60	Dr. A. L. Heermann.
2488	.....	Western America, (labelled Wis. !)	.....	J. G. Bell .....	....	Skin in alc. ....	....	....	....	....	.80	1.45	....	....	....	.....

SPERMOPHILUS FRANKLINI.

Grey Gopher.

Arctomys franklini, SABINE, in Linn. Trans. XIII, 1822, 587; pl. xxvii.—*Id.* in Narr. Franklin's Journey, 667.
HARLAN, F. Am. 1825, 167.
FISCHER, Synopsis, 1829, 343.
GODMAN, Am. N. H. II, 109.
Arctomys (Spermophilus) franklini, RICH. F. B. Am. I, 1829, 168; pl. xii.

Spermophilus franklini, F. CUVIER, Suppl. Buffon, I, Mamm. 1831, 328.

WAGNER, Suppl. Schreb. III, 1843, 244.—*Id.* in Schreb. Säugt. IV, pl. ccx, A. (No text.)

AUD. & BACH. N. Am. Quad. II, 1851, 248; pl. lxxxiv.

KENNICOTT, Rep. Patent Office, 1856, Agriculture, (1857,) 79; pl. ix.

SP. CH.—About the weight of the small gray squirrel, (*Sciurus carolinensis*.) Tail, with the hairs, rather more than half the head and body. Ear with a distinct auricle, but very small. Color above, light yellowish brown, varied with black; top and sides of head and sides of neck, pure hoary gray; beneath, whitish. Length, about 9 inches; tail, about 5½ inches. Hind foot, 2.10 inches.

This species in its proportions is much like the *S. ludovicianus*. The tail is longer and more bushy, and the ears rather larger. The thumb nail is more developed than in the sciurine spermophiles, but shorter and smaller than in *S. ludovicianus*. The upper parts are of a light yellowish brown, variegated with black in obscurely sub-quadrate spots; the top and sides of the head and sides of neck are pure hoary gray; the under parts soiled yellowish white. The tail shows a mixture of light brown, white and black; its margin all round is grayish white, and the hairs generally are of this color, but with three bars of black, most distinct when viewed from beneath. The soles of the feet are densely furred to the tubercles in winter.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Measurements.									
							Tip of nose to—				Tail to end of—		Length of—		Skull—	
							Eye.	Ear.	Oecip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.	Length.	Width.
192 ¹	.....	.....	Racine, Wis .....	.....	Dr. P. R. Hoy.	Skin.....	.....	.....	.....	9.00	3.75	4.85	.....	2.10	.....	.....
985	.....	○	.....do .....	.....	.....do	do .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2494	.....	.....	.....do .....	.....	.....do	Skin in alcohol.....	.....	.....	.....	.....	5.35	6.50	.....	.....	.....	.....
2495	.....	.....	.....do .....	.....	.....do	do .....	.....	.....	.....	.....	4.46	5.50	.....	.....	.....	.....
2496	.....	.....	.....do .....	.....	.....do	do .....	.....	.....	.....	.....	5.20	6.25	.....	2.17	.....	.....
2497	.....	.....	.....do .....	.....	.....do	do .....	.....	.....	.....	.....	3.60	4.15	1.03	1.90	.....	.....
.....	1885	♀	do .....	.....	.....do	Skull .....	.....	.....	.....	.....	.....	.....	.....	.....	2.06	1.20
973	.....	.....	West Northfield, Ill.	August	R. Kennicott	Skin .....	.....	.....	.....	9.00	4.75	5.60	.....	2.10	.....	.....
1403	2238	.....	.....do	Winter, 1855	do	do .....	.....	.....	.....	.....	4.40	5.30	.....	.....	2.10	1.20
2049	3089	♂	do	Winter	do	do .....	.....	.....	.....	.....	.....	.....	.....	2.10	2.12	1.25
1233	.....	.....	Quasqueton, Iowa.....	May 7, 1854	Dr. E. C. Bidwell...	do .....	.....	.....	.....	9.00	.....	.....	.....	2.10	.....	.....
2493	.....	.....	Wisconsin? .....	.....	J. G. Bell	Skin in alcohol.....	.98	1.70	2.18	8.58	4.30	5.20	1.09	1.80	.....	.....

¹ Longest fore claw, .42 inch; of hinder claw .30 inch.

SPERMOPHILUS TERETICAUDUS, Baird.

Round Tailed Spermophile.

SP. CH.—Ears nearly obsolete. Tail, with hairs, at least four-fifths as long as the head and body; rounded, with the hairs close pressed all round; somewhat expanded at the tip. Feet very broad, the soles densely hairy, except on the sides. Color above, finely grizzled gray yellowish brown; beneath, dirty white. No spots on the body, nor distinct annulations on the hairs of the tail. Length, five to six inches. Tail, half an inch to an inch less. Hind feet, 1.36 inches.

This very curious small spermophile is in several respects very different from any other of the North American species, exhibiting quite unusual combinations of characters. In size it is about equal to or, perhaps, a little larger than the common ground squirrel of the Atlantic

States, (*Tamias striatus*), and in everything but the long round tail it is a minature of the prairie dog.

The head is short and broad, the whiskers black, and reaching to the occiput. The nose is entirely hairy, the narrow septum of the nostrils being alone naked. The external ears in the dried specimen appear entirely wanting; in those preserved in alcohol they appear like a very low thickened margin to the ear opening. The feet appear disproportionately large and stout, and very similar to those of the prairie dog.

The anterior claws are larger than the posterior, strong and considerably curved. The thumb is rudimentary and armed with a short thickened nail—not a claw. The third claw is longest, then the fourth, the second a little shorter. The hind feet are very broad, the soles densely coated with long stiff hairs, except on and between the tubercles at the bases of the toes.

The tail is long, the vertebral portion alone nearly equal to the body, exclusive of head and neck; it is nearly cylindrical, not appreciably flattened or distichous, the hairs close pressed; it ends in a slight brush.

The color is very similar to that of a light colored prairie dog; it is of a dull yellowish brown, very finely grizzled with lighter tips; beneath, it is dirty brownish white. The tail agrees in color with the corresponding regions of the body; the hairs above are faintly annulated; it is dark at the end, with a yellowish tip.

This animal is so entirely different from any other known North American species as to render any special comparisons unnecessary. It was first discovered by Major Thomas at Fort Yuma.

List of specimens.

Catalogue number.	Number of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.						
						Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore foot, length.
1584	2419	♂	Fort Yuma, Cal.....	Major G. H. Thomas.....	Skin .....	.....	.....	1.60	5.25	4.42	4.84	.....
1585	.....	.....	.....do	do	Body in alcohol....	.68	1.28	1.58	6.08	3.60	.....	.90
2490	.....	○	.....do	do	Entire in alcohol...	.55	1.14	1.30	3.84	2.80	3.27	.75

¹ Skull 1.42 + .85.

SPERMOPHILUS TRIDECIM-LINEATUS.

Striped Prairie Squirrel.

Sciurus tridecem-lineatus, MITCHELL, Medical Repository, XXI, Jan. to June 1821, 248. (Brought from the sources of the Mississippi by Prof. Douglass, U. S. A.)

DESMAREST, Mammif. II, 1822, 339.

Arctomys tridecem-lineatus, HARLAN, F. Am. 1825, 164.

Spermophilus tridecem-lineatus, AUD. & BACH. N. Am. Quad. I, 1849, 294; pl. xxxix.

Hoy, Rep. U. S. Patent Office, 1854? Agricultural, p. .

KENNICOTT, Rep. U. S. Patent Office, Agricultural, for 1856, (1857,) 74; plate viii.

Arctomys hoodii, SABINE, Linn. Transactions, XIII, 1822, 590; pl. xxix.—*Id.* in Franklin's Journal, 663.

Arctomys hoodii, GRIFFITH's, Cuvier, III, 1827, 186; plate (original figure.)—IB. V, 1827, 247.

FISCHER, Synopsis, 1829, 544.

WAGNER, in Schreber Säugt. IV; pl. ccx, C. (no text.)

Arctomys (Spermophilus hoodii), RICH. F. B. Am. I, 1829, 177; pl. xiv.

Spermophilus hoodii, F. CUV. Suppl. Buff. I, Mammif. 1831, 337.

PRINCE MAX. Reise in das innere Nord-Amerika, I, 1839, 449.

WAGNER, Suppl. Schreb. III, 1843, 251.

SP. CH.—About the size of *Sciurus hudsonius*. Ears very short. Tail vertebræ about half the length of body, or a little longer. Claws long; that of thumb rather diminutive. Above dark brown, with light stripes and lines of light spots alternating with each other, six of the former and five of the latter generally very distinct. Tail with a brownish yellow margin and tip, and within this a border of black. Length, 5 to 6 inches. Tail vertebræ, 3.50 to 4 inches. Hind foot, 1.30 to 1.40.

This species is in a measure intermediate between the form typified by *S. ludovicianus* and that of *S. beecheyi*. The ears are short and reduced to a mere rim, as in *S. franklinii*, which, indeed, it resembles in many other respects. The claws are very long; that on the thumb being very short, though decidedly claw-like, and not a mere nail. The soles are sparsely covered with long hair. The tail varies in length, though generally about half the length of the body, or a little more.

The general color above is of a dark brown, sometimes nearly black, the lower parts of the sides and under parts light yellowish brown. The upper parts are longitudinally and symmetrically striped with continuous yellowish white lines and lines of spots, the number distinctly traceable varying with the specimen. On each side of the vertebral line there are three well defined lines, most distinct on the middle of the body, with indistinct traces of one or two below these. The vertebral line itself is occupied by a row of spots, and all the spaces between the continuous lines described are similarly traversed, although two on each side the median line are all that are distinct. Anterior to the shoulders, the spots in each line generally become confluent. The top of the head is occupied pretty uniformly by spots. In some specimens there is a slight or obsolete interruption at intervals to the continuity of the stripes, caused by the darker tips of the hairs. The tail is brownish yellow, with a broad subterminal band of black, the hairs being each so marked. In some specimens the central portion of the tail has a chestnut tinge, although the yellowish margin and tip, with the black line within this, are usually distinctly visible.

In comparing an extensive series of specimens of this species from various parts of the country, those from Wisconsin are seen to differ quite materially from those further west, in a considerably larger size and darker color. The ground color between the stripes is of a very dark brown, almost black, and the stripes are rather further apart. The under parts, too, are perhaps a little more dusky. I do not, however, find any other characters of importance. The spots and lines are not so large in proportion as in the lighter prairie specimens.

Measurements of skulls.

No.	Locality.	Length.	Width.	No.	Locality.	Length.	Width.
1264	Racine.....	1.59	.90	835	R. A. Jacques, Minn.....		.96
919	-----do-----	1.68	1.00	1303	Head of Arkansas.....	1.40	.82
920	-----do-----	1.63	1.95	1304	-----do-----	1.46	.86
1351	Fort Kearney.....	1.56					

SPERMOPHILUS MEXICANUS.

Mexican Ground Squirrel.

Sciurus Mexicanus, ERXLEBEN, Syst. Ann. 1777, 428.

Citillus Mexicanus, LICHTENSTEIN, Darstel. Säugt. 1827, 1834; tab. xxxi, fig. 2, (Toluca.)

Spermophilus Mexicanus, WAGNER, Suppl. Schreb. III, 1843, 250.

AUD. & BACH. N. Am. Quad. III, 1853, 39; pl. cix, (exclusive of fig. of supposed young.)

Otospermophilus Mexicanus, BRANDT, Bull. Phys. Math. Acad. St. Pet. 1844, 379.

GIEBEL, Säugt. 1855, 638.

Urion & Ardilla, of the Mexicans.

Size that of *S. hudsonius*, or larger. Tail vertebræ about half the length of body, the outstretched hind feet reaching about to its middle. Ears short, but distinct. Thumb with a stout rudimentary claw. Central line of the soles hairy halfway to end of metatarsus. Color above dark chestnut brown, tinged with olivaceous, with nine to eleven pretty distinct longitudinal rows of subquadrate light spots. Tail margined with whitish, within which are two black bands, (to three light ones,) the extreme base of the hairs being sometimes dusky in addition. Length, 7 to 8 inches; tail, with hairs, 5 to 5½; hind feet, 1.65 inches.

In size and general characters this species is not very dissimilar to *S. 13-lineatus*, of which it is the more southern representative. The head is shaped much like that of the latter species, being somewhat acute, as in *Sciurus hudsonius*, and differing considerably from that of *Spermophilus spilosoma*. The ears are short though quite distinct, the auricle running longitudinally and well covered with hairs on both sides. The feet are well developed; the claws very long and slightly curved. The thumb is armed with a stout rudimentary claw, rather than a mere nail, although there is considerable difference in this respect with specimens. The third claw is longest; the fourth rather shorter; the second extending to the middle of the claw of the third; the fifth to the base of the claw of the fourth. The palms are naked. The claws of the hind feet are weaker than those in front; the third is longest; the second and fourth equal, and but little shorter; the first shorter than the fifth, which does not extend nearly to the base of the claws of the longest toes. The soles are coated with scant hairs beneath the tarsus and part of the metatarsus, principally along the median line. The tail vertebræ are about half the length of the body, or a little more, and the hairs are much longer than usual in this group, much more so than in *S. 13-lineatus*. The under part of the tail is sparsely covered, and the tail exhibits a flattened appearance.

The upper parts and sides generally are reddish brown or a shade of chestnut brown, sometimes tinged with olivaceous, the precise tint varying considerably with the specimen, and sometimes much overloaded with the black tips to the hairs. This color is relieved by a series of longitudinal rows of whitish spots extending from the occiput to the tail; of these there can generally be traced four or five on each side of the median or vertebral one, the spots of different rows mostly opposite each other; the intervals between the rows about equal to the spots themselves. In some specimens the narrow intervals between the spots of one series are black, in others of the ground color, though always mixed up with black. The spots are more or less quadrate, and average, perhaps, the eighth of an inch in size. The hairs are lead color at the base; those occupying the light spots are black immediately beyond the root, and have a short black tip, the whitish being subterminal; interspersed among the brown tipped hairs are many that are black throughout. The top of the head is coarsely grizzled with whitish brown and black. The eyelids and under parts generally are dull whitish or brownish white, clearest on the head. Those posteriorly exhibit a little dusky at the base; anteriorly, however, they are unicolorous.

The basal portion of the tail is grizzled not unlike the top of the head; the terminal portion

is mixed black and dull brownish yellow or whitish, which tint shows almost uniformly beneath and broadly on the margin and tip of the tail. When the tail is flattened at the tip it shows distinctly a very broad bar of black within the light margin, and another narrow bar of the same half way between this and the extreme base, which is also black. There are thus exterior to the dark base two bars of black and three of whitish, the basal half of the hairs being light colored, with a narrow dark bar in the centre, as also at the base; the terminal half black and light colored, about equally divided, except towards the tip where the black is more extended.

Specimens vary, as already stated, in the tint of the ground color above and in other characters, the length of hair on body and tail, &c. Sometimes the dusky base to the caudal hairs is obsolete. In one (231) the hairs at the tip are very long, over two inches; but this seems abnormal. Many of these differences are, however, doubtless those of season.

This species can be readily distinguished from its nearest allies, *S. 13-lineatus* and *S. spilosoma*. The ground color of the former species is darker, and the alternating stripes and lines of spots are unmistakably different; its tail is shorter and less bushy, while the hairs are dull whitish or yellowish white, with only one median broad bar instead of two. In the skulls there is a very close resemblance. From *S. spilosoma* it differs by its more acute muzzle, the much greater distinctness of spots, more conspicuous ears, longer and fuller tail, its hairs having two bars of black instead of one bar, which at the tip extends to the very base. The skulls of the two are very different, in the much shorter and more convex form of the latter, &c.

In Captain Pope's collection are several specimens from the Pecos river, which may be considered as the most northern limit yet recorded for the species. They are duller than those from the Rio Grande, the fur being in very old and ragged condition, probably just about to be replaced by new.

This is probably the species to which Erxleben gave the name of *Sciurus Mexicanus* in 1777. It was first accurately described by Lichtenstein from a specimen collected near Toluca. How much further south it extends I am unable to say. The Rio Grande appears to be nearly its northern limit.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—
								Tip of nose to eye.	Tip of nose to ear.	Tip of nose to occip.	Tip of nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	
518 ¹	1652	....	Pesquiera Grande, Mex.	May, 1853	Lt. D. N. Couch...	203	Skin	...	...	...	...	...	...	...	1.50	.....
240	....	○	Matamoras, Mexico	.....	.....do.	.....	do.	...	...	...	...	...	...	...	...	.....
2498	....	....	do.	.....	.....do.	.....	In alco ^l .	.84	1.60	1.90	7.52	3.83	5.50	.95	1.65	Dr. L. Berlandier.
2499	....	....	do.	.....	.....do.	.....	do.	.83	1.65	1.95	6.98	...	...	.95	1.50	do.
2500	....	....	do.	.....	.....do.	.....	do.	.80	1.53	1.90	6.80	...	...	.95	1.55	do.
2501	....	....	do.	.....	.....do.	.....	do.	.55	1.10	1.30	3.10	2.00	2.30	.63	1.00	do.
2502	....	....	do.	.....	.....do.	.....	do.	.55	1.10	1.30	3.10	2.00	2.30	.63	.93	do.
352	1425 ^a	....	Brownsville, Texas	Feb., 1853	do.	.....	Skin	...	...	...	8.50	4.50	5.75	...	1.62	.....
140	1267	○	Eagle Pass, Texas	1852	Maj. W. H. Emory	.....	do.	...	...	...	...	...	...	...	...	.....
155	1137	....	do.	1852	do.	.....	do.	...	...	...	8.50	4.25	5.20	...	1.50	Arthur Schott...
139	1122	....	do.	1852	do.	.....	do.	...	...	...	8.25	4.25	...	...	1.25	do.
291	....	....	Texas.	1853	do.	.....	do.	...	...	...	...	...	...	...	1.45	J. H. Clark.....
1719	....	....	Western Texas.	.....	Capt. J. Pope.....	.....	do.	...	...	...	8.50	...	...	...	...	.....
1746	....	....	Pecos river, Texas.	May 14, '55	do.	81	do.	...	...	...	...	...	...	...	1.52	.....
2656	....	....	Fort Bliss, N. M.	.....	Dr. S. W. Crawford.	.....	In alco ^l .	.52	1.52	1.78	6.40	4.50	5.70	1.02	1.65	.....

¹ Eye dark brown; skin of feet white.

^a Skull 1.75 + 1.03 inches.

SPERMOPHILUS SPILOSOMA, Bennett.

Sonora Ground Squirrel.

Spermophilus spilosoma, BENNETT, Pr. Zool. Soc. I, 1833, 40.

WAGNER, Suppl. Schreb. III, 1843, 251. (Note.)

BAIRD, Pr. A. N. Sc. Phila. VII, 1855, 332.

Spermophilus mexicanus, AUD. & BACH. N. Am. Quad. III, 42; pl. cix, (figure of supposed young of *S. mexicanus*, correctly marked *S. spilosoma* in pl. cix of large edition.)

SP. CH.—Size less than *Sciurus hudsonius*; ears very short, almost obsolete; tail vertebrae, about half the length of the body, or rather less, its hairs depressed and moderate in length; thumb claw distinct, a central linear hairy patch on the sole, extending nearly to the end of metatarsals; above reddish brown, with indistinct subquadrate spots of reddish white, most distinct posteriorly and in young specimens, with the posterior border only blackish, the hairs having black at the tip alone; tail margined and tipped with very pale yellowish brown, within which is a broad black border, the hairs on the sides of the tail having one median black bar, at the tip of the tail this black extending to the very base; length, about 7 inches; tail, with hairs, a little more than half as much; hind foot, 1.25 inch.

This species bears a considerable resemblance in several points to *S. mexicanus*, so much so, indeed, that Audubon and Bachman have combined them as one. A comparison of many specimens shows conclusively, however, that they are really more distinct than the latter is from *S. 13-lineatus*. Its affinities are quite near to *S. townsendii*.

The muzzle of this species is remarkably short, more so than in almost any species known to me, this character being evident in the skin as well as in the skull. The external ear is exceedingly short, appearing as if cut off very close to the skin, with the slightest possible projection above it. The thumb is armed with a short gouge-shaped claw which, though short, is as large as the basal half of that on the fifth finger. The nails generally are longer than in *S. mexicanus*; the third longest, the fifth extending beyond the base of that of the second. The palms are naked. The three central toes are nearly of equal length, the fifth reaching the base of the claw of the fourth, the first about to that of the fifth. The soles are covered with long hair down the middle, more densely than in *S. mexicanus*. The vertebrae of the tail of this species are about half the length of the body, extending for about one-fourth their total length beyond the outstretched hind feet. The tail is rather thinly clothed with hair all over, almost cylindrical, with the hairs arranged longitudinally for the basal half, beyond which it widens out, with the hairs longer though much less bushy and flattened than in *S. mexicanus*.

The ground color of the upper parts generally is a light reddish brown or cinnamon, varied, especially posteriorly, with numerous indistinct subquadrate spots of reddish white, about one-eighth of an inch in diameter, arranged irregularly as far as can be ascertained, and not serially as in *S. mexicanus*. These spots are bordered posteriorly by black, and there are other black hairs interspersed. The hairs are almost sooty black at the base, then reddish brown to the tip, except in those occupying the region of the light spots, where they are subterminally lighter, with the extreme tip black. The top and sides of the head, with the basal half of the upper part of the tail, are finely grizzled with the three colors just mentioned. The eyelids and under parts generally are brownish or reddish white. The longer lateral hairs on the terminal half or third of the tail are black for rather more than their central third, with the basal portion of the reddish brown described, and the apical light yellowish brown lighter than the base. At the extreme tip, however, the black extends to the very base, thus affording but the two colors. At no point can two rings of black be distinguished—it is only towards the end of the tail that the black can be easily detected at all.

A specimen (No 141) differs from that just described (142) in being larger, and having the light spots very indistinct and scarcely appreciable, even posteriorly. It is probable that the spots are most distinct in younger specimens.

The differences between this species and *S. mexicanus* can be readily expressed. The ears are decidedly shorter and more rudimentary; the tail is narrower, much less bushy, particularly on the basal portion; the claws are larger and blacker, the thumb claw larger, the soles more hairy. The color is brighter, being strongly reddish brown or cinnamon; the spots are not arranged serially, and are more indistinct, their posterior portion only, black instead of the anterior likewise, this being due to an essential difference in the colors of the hair occupying the spots. In *S. mexicanus* they are black beyond the lead-colored base, with a subterminal light portion and black tip; in the present they are reddish brown beyond the basal color, then light-colored, and tipped only with black. The basal color, generally, is much deeper. The hairs on the sides of the extremity of the tail have *one* black central space, with a narrower base, and tip of lighter tints, while those at the extreme tip are black to the base, with light tips; in *S. mexicanus* all these hairs have *two* black rings, both at sides and tip, the light portion being uniform throughout.

It is true that the young animals are more distinctly spotted than the adults, but they may always be distinguished from small specimens of *S. mexicanus* by the fact that the spots are not arranged in regular linear series, and are not distinct on the anterior half of the body. The ground color is also always more chestnut in tint.

Differences of equal value are discernible in the skulls; that of the present species being shorter, broader, the orbits larger, the muzzle blunter, &c.

S. townsendii differs in having the ground color above darker, and a much shorter tail.

This species was first described from specimens collected on the western coast of Mexico. The vicinity of El Paso seems to be its eastern, and the Gila its northern limit. It was erroneously considered to be the young of *Spermophilus mexicanus* by Audubon and Bachman.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								Tip of nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of hind foot.	
590	1651	....	Chihuahua city	1853.	John Potts. ....	....	Skin	6.50	....	....	1.10	.....
1059	....	....	do.	1855.	do. ....	....	do.	7.00	2.20	3.00	1.25	.....
1042	2216	....	Janos, Sonora	April, 1855	Maj. W. H. Emory .....	....	Mounted ..	5.75	2.60	3.20	1.28	Dr. C. B. Kennerly.
141	1123 ¹	♀	El Paso	1852.	do. ....	....	do.	6.50	3.00	3.75	1.25	J. H. Clark.
142	1124 ¹	....	do.	1852.	do. ....	....	do.	5.50	2.50	3.00	1.25	do.
2620	....	....	Fort Thorn, N. M. ....	....	Dr. T. C. Henry .....	....	do. ....	....	....	....	1.15	....
2619	....	....	Fort Stanton, N. M. ....	....	do. ....	....	do. ....	....	....	....	1.26	....

¹ Skull 1.54 + .98 inch; mammæ 10.

² Skull 1.45 + .97 inch.

SPERMOPHILUS PARRYI.

Parry's Marmot.

Arctomys parryi, RICHARDSON, App. Parry's Second Voyage, 1825, 316.

HARLAN, F. Am. 1825, 170.

GRIFFITH's Cuvier, V, 1827, 247.

FISCHER, Synopsis Mam. 1829, 344.

GODMAN, Am. N. H. II, 120.

WAGNER, in Schreber Säugt. IV, pl. ccx, D. (No text.)

Arctomys (Spermophilus) parryi, RICH. F. B. A. I, 1829, 158; pl. x.—*ib.* var. *♂ erythrogluteia*, and *γ phaeognatha*, 161.

F. Cuv. Suppl. Buffon, I, Mammif. 1831, 314.

Spermophilus parryi, BRANDT, Bull. Phys. Math. Acad. St. Petersb. II, 1844, 372.

AUD. & BACH. N. Am. Quad. I, 1849, 77; pl. ix.

"*Arctomys alpina*, PARRY, Narrative 2d Voyage, 61."

"*Arctomys citillus specimina camtschatica*, PALLAS, Glires, 127."

"*Citilli americani*, PALLAS, Zoog. Rosso-Asia I, 158."

"*Jevrachken or Pischtschungen*, STELLER, Kamtschatka, 126." (The three last references borrowed from Brandt.)

SP. CH.—Size of fox squirrel. Tail full and bushy, with long hairs; nearly half as long as the head and body. Soles naked in summer. Above, mixed black, white, and yellowish brown, with crowded subquadrate whitish blotches. Beneath, rusty white. Top of the head uniform chestnut. A light ring round the eye. Length about 12 inches; tail, 5 to 6 inches; hind foot, 2.30 inches.

It is somewhat questionable whether this spermophile ever comes within the limits of the United States; at least, its presence has not been detected by any of our recent expeditions. For the purposes of completing the account of the American species, I make use of a skin collected on the island of Arikamthitchi, in Behring's Straits, by the North Pacific Exploring Expedition, under Captain Rodgers. Many specimens were obtained by the expedition, both as skins and in alcohol, and the published report of the zoology of the party will contain much fuller details respecting the species.

In size this animal appears nearly equal to the fox squirrel of the eastern United States, or about the size of the larger specimens of the California ground squirrel (*Spermophilus beecheyi*). The head is much more curved than in this last mentioned species, and is broad in comparison with the length. The ears are very short, in fact, they form little more than a rim to the auditory aperture. The whiskers are long and black. The end of the muzzle only is naked, or the portion immediately round the nostrils and the septum, which is indented by a furrow.

The feet are large and strong, especially the anterior ones, which are eminently fossorial, with their claws longer and stronger and a little more curved than those on the hind feet, which are nearly straight. The thumb is rudimentary, armed with a very small pointed claw, not a nail. The third finger is longest, the fourth and second successively a little shorter. The soles are quite naked from the heel, except that the hairs on the side of the heel grow over towards the central line, and impart to it a hairy appearance.

The tail is quite short, the outstretched hind feet reaching nearly to the end of the vertebræ. With the hairs it is about half as long as the trunk, (exclusive of the head.) It is quite full and bushy, as much so as in the woodchuck, (*Arctomys monax*), decidedly depressed, with terminal hairs half the length of the vertebræ.

The prevailing color of this species is a mixed black, whitish and yellowish brown above, lighter on the sides, and rusty white beneath. On the back the white is in the form of thickly

crowded, not very strongly marked, subquadrate blotches, separated by black and yellowish brown; towards the nape this mottling blends into a more uniform grayish, and a similar condition is seen on the sides, where obsolete black forms a faint mottling. The under parts are of a rusty yellowish white, deepest between the fore legs, on the sides of the head and neck, the axillæ. The throat and chin and the genital regions are dirty white. The top of the head is a chestnut brown, paler towards the occiput. There is a ring round the eye of a lighter color than the rest of the face.

The upper part of the tail is a mixed black and yellowish gray, the margin all round a pale brownish white or yellowish; there is a broad subterminal bar of black, about one-third as long as the caudal vertebræ. The under surface of the tail, within the light-colored margin, is a uniform light chestnut, the subterminal black showing through. The hairs beneath the tail show no annulation whatever, except near the tip, where they are mostly black, but with chestnut base and pale tip. Above, the caudal hairs are annulated black and grayish yellow.

The under fur is quite full and soft, even in the summer specimens; everywhere sooty black at the base, then abruptly of a grayish yellow, passing into pale rusty, this latter color deepest on the back, becoming paler on the sides and beneath. On the back and sides numerous long stiff hairs are interspersed, either entirely black, or else with a subterminal grayish white or rusty white annulus, the extreme tip generally black. The mottling of the back is chiefly due to this annulation.

This species is quite closely allied to the *Spermophilus eversmannii* of Siberia, (Nos. 1455, 1967,) but is readily distinguished by larger size, shorter and more bushy tail. The top of the head is much more rusty, the subterminal black bar of the tail much broader. For the sake of comparison I give the measurements of two Siberian specimens of *S. eversmannii*.

Although it is by no means certain that this animal is identical with *Spermophilus parryi*, yet there appears to be no reasonable doubt on the subject. There is nothing to prevent the mammalia of the northwestern portions of this continent from passing over to Asia, as the strait intervening is frozen solid every winter. Brandt, and the Russian zoologists generally, give the Siberian and American species as identical.

Measurements.

Current number.	Name.	Locality.	Tip of nose to—		Tail to end of—		Length of—		Longest—	
			Occip.	Tail.	Verteb.	Hairs.	Fore foot.	Hind foot.	Fore claw.	Hind claw.
2651	<i>Spermophilus parryi</i> -----	Aricamitchichi ----	2.50	12 00	3.40	5.00	1.60	2.30	.63	.35
1455	<i>Spermophilus eversmanni</i> ..	Buchtorma, Sib-----	-----	10.75	3 80	5.30	1.20	1.90	.42	.33
1967	-----do-----	East Siberia -----	2.20	9.50	4.70	5.85	1.30	2.00	.44	.36

SPERMOPHILUS RICHARDSONII.

Richardson's Ground Squirrel.

Arctomys richardsonii, SABINE, Linn. Trans. XIII, 1822, 589; pl. xxviii.—IB. Narr. Franklin's Jour. 662.

HARLAN, F. Am. 1825, 168.

GRIFFITH'S CUV. V, 1827, 246.

GODMAN, Am. N. H. II, 246.

WAGNER, in Schreb. Säugt. V; pl. ccx, B. (Interpolated; no text.)

Arctomys (Spermophilus) richardsonii, RICH. F. B. A. I, 1829, 164; pl. xi.

Spermophilus richardsonii, F. CUVIER, Suppl. Buffon, I, Mamm. 1831, 321.

WAGNER, Suppl. Schreb. III, 1843, 243.

AUD. & BACH. N. Am. Quad. I, 1849, 377; pl. 1.

SP. CH.—Rather larger than *Sciurus hudsonius*. Tail about one-third, or a little more, the length of head and body. Ear very short, though with a distinct flap. A distinct thumb claw. Color above, uniform yellowish brown, without spots or lines of any kind. Length, 8 inches; tail, $3\frac{1}{2}$; hind foot, $1\frac{1}{2}$ inch.

Of this species no specimens were collected by any of the expeditions, and I accordingly make use of one belonging to the Philadelphia Academy of Natural Sciences for the purpose of description. It was collected in the Rocky Mountains by Townsend, but is, unfortunately, not in very perfect condition, the tail appearing somewhat mutilated.

In size, this animal rather exceeds Wisconsin specimens of *Spermophilus tridecemlineatus*. The auricle of the ear is thickened and elongated, but low, its greatest height above the base not exceeding two-tenths of an inch. The whiskers are rather short and black. The fore claws are longer than the hinder ones; the thumb is rudimentary, but its claw is quite long and conspicuous, almost equal to the fifth claw. The tail is short, and in this specimen quite slender, and uniformly cylindrical to the tip, without any flattened appearance whatever. It is, however, probably mutilated.

The upper parts are of a light yellowish brown, or dull brownish yellow, nearly uniform, but with the faintest possible trace of dusky clouding, where the darker bases of the hairs show themselves. The side of the face is nearly uniformly colored with the top of the head; the eyelids and an area between the eye and ear are rather lighter colored. The under parts and sides are dull yellowish, lighter than the back, and shading imperceptibly into it. There is a faint wash of stronger yellowish on the sides of the neck in advance of the shoulders.

Measurements.

	Inches.
Head and body.....	8.00
Tail vertebrae.....	1.7
Hind foot.....	1.3

According to Audubon and Bachman, the tail of this animal, when perfect, measures $2\frac{1}{2}$ inches to the end of vertebrae, and $3\frac{1}{2}$ to end of the hairs; the hind foot, $1\frac{1}{2}$ inch.

A very imperfect skin of a spermophile, belonging to the National Institute, and obtained on an island in the Sault Ste. Marie, Michigan, approaches this very closely, but is not in such

condition as to admit of a satisfactory description. The claws are more sciurine in character, the anterior being much more curved than in the *Spermophilus richardsonii*, and more nearly equal to the hinder ones. The thumb is rudimentary, and armed with a broad, blunt nail, instead of a well developed claw. The soles are nearly naked, except on the middle, where they are hairy. The tail and skull are wanting. The fur is very stiff and coarse. The color is a dull yellowish chestnut above; beneath, rusty yellowish white.

Dr. Hayden met with a small spermophile in 1855, probably of this species, in considerable numbers, a little south of the United States boundary line of 49°, and north of Fort Union; he was, however, unable to obtain specimens. According to Richardson, it inhabits the grassy plains lying between the north and south branches of the Saskatchewan, living in deep burrows in the sandy soil.

SPERMOPHILUS TOWNSENDII, Bach.

Townsend's Ground Squirrel.

Spermophilus townsendii, BACHMAN, J. A. N. Sc. Phil. VIII, I, 1839, 61.—IB. In Townsend's Narrative, 1839, 316.

WAGNER, in Wiegmann's Archiv, 1843, II, 45.

AUD. and BACH. N. Am. Quad. III, 1853, 226; pl. cxlvii, f. 1.

Arctomys (Spermophilus) gultatus? Rich. F. Bor. Am. I. 1829, 162.—IB. Zool. of Blossom, 1839, 12.

WAGNER, Suppl. Schreb. III, 1843, 239. (Note.)

? *Spermophilus gultatus*, SCHINZ, Syn. Mam. II, 1845, 66.

SP. CH.—About the size of *Sciurus hudsonius*; ears obsolete; tail cylindrical, very short, with the hair, scarcely twice the length of hind feet. Above, dark brown, with numerous obsolete and crowded light spots; belly whitish. Length about 7 inches; tail less than 2 inches; hind foot 1.30.

As no specimens of this species were collected by any of the expeditions, I have based a description upon the original of Bachman's article, in the collection of the Philadelphia Academy of Natural Sciences. The mounted animal is in rather a greasy condition, and does not admit of a very satisfactory description. It is marked as collected in the Rocky Mountains, by Townsend.

The animal appears to be rather longer than *S. tridecemlineatus*. The ears are very short, with scarcely any projecting auricle. The tail is very short, with the hairs scarcely twice the length of the hind feet. The feet are large and broad. I cannot speak of the character of the soles, as these are fastened to the board on which the animal is mounted.

The upper parts are of a dark brown, with numerous crowded obsolete light spots; the belly and feet dull brownish white; the tail above is colored like the body; beneath, rather reddish; there are no distinct bands in the hairs as in most species.

Measurements.

	Inches.
Length to root of tail (along the curve of the back) .	8
Tail vertebræ -----	1. 32
with hairs -----	1. 90
hind feet -----	1. 30

This species comes quite near to the *Spermophilus guttatus* of Asiatic Russia. A typical specimen (1450) of the latter species has the spots much more distinct and larger, the ground color of the back very similar to that of *S. mexicanus*, and with the spots quite similar, though larger, more quadrate, and more crowded; as well as without the distinctly linear arrangement of *S. mexicanus*. Another specimen, (1643,) from the shores of the Caspian, however, has the spots much less distinct, and more, as in *S. townsendii*, owing to their yellowish rusty color, and the much paler hue of the ground. The tail is also shorter and more cylindrical. In both, however, the tail is shorter than in *S. townsendii*.

This species was first described by Richardson as a variety of *S. guttatus*. According to Schinz, an American species first received the name of *guttatus*, for which reason he calls the Siberian animal *guttulatus*. I am unable to find any description of an American marmot under the name of *A. guttatus* prior to the date of 1827, when Temminck gave it to the Siberian animal. Schinz refers to the Rocky Mountains as the habitat of his *S. guttatus*, which agrees very well with *S. townsendii*. He quotes Temminck, Mon. Mamm. I, p. xxvii, and Cuv. and Geoff. Mammif. III, Lev. 45.

In the preceding pages I have given all the species of spermophiles that have come under my notice, and I have little doubt that they embrace all that are well established as inhabitants of America, north of Mexico. It will be seen that none are found east of the Mississippi river, with the exception of *Spermophilus 13-lineatus*, which reaches as far as the eastern portion of Michigan, and *franklini*, which is found in Illinois. Further west they become more abundant, and have their greatest development in the region between the Missouri and the Rocky Mountains, extending northward to the Arctic ocean, and south into Mexico. This is especially the home of the species with very short ears, rather short tail, and soles usually more or less hairy. In the Rocky Mountains we first find the Spermophiles with long ears and long full tail, and having much the appearance and habits of the squirrels; these extend west, becoming more and more numerous in individuals to the Pacific coast. A single species occurs in eastern Mexico, south of the Rio Grande, (*S. couchii*.)

The remaining species, described as North American by various authors, are as follows:

SPERMOPHILUS ANNULATUS, Aud. and Bach.

Spermophilus annulatus, AUD. and BACH. J. A. N. Sc. Phil. VIII, II, 1842, 319.—IB. N. Am. Quad. II, 1851, 213; p. lxxix.

The animal described under this name by Audubon and Bachman was purchased by me from a dealer many years ago and presented to Mr. Audubon. It was supposed to have been brought from the west, and, as such, was described by the above authors. I have, however, little doubt that it is an African species of *Sciurus*, and, in fact, it resembles closely, if it be not identical with, the *Sciurus rufobrachiatus* of Fraser, in Zoologia Typica, said by him to be closely related to the *Sciurus annulatus* of western Africa. In any event, it must be eliminated from the list of North American spermophiles.

SPERMOPHILUS MACROURUS, Bennett. Hab. west coast of Mexico.

Spermophilus macrourus, BENNETT, Pr. Zool. Soc. Lond. I, 1833, 41.

AUD. and BACH. N. Am. Quad. III, 1853, 181; pl. cxxxix.

WAGNER, Suppl. Schreb. III, 1843, 246.

Otospermophilus macrourus, BRANDT, Bull. Phys. Math. Acad. St. Pet. II, 1844, 380.

"Size of the cat squirrel, (*Sciurus cinereus*;) fur rather coarse; body mottled with black and ashy white, forming irregular narrow transverse bars on the back and sides; tail as long as the body, (exclusive of head?) and moderately bushy. Top of head pure black; muzzle rufous brown above, whitish on the sides. Back of the ears blackish brown. Hairs of the tail long, (some of them two inches;) brownish white, annulated by three broad black rings, the sub-terminal one broadest. Length to root of tail, 13 inches; of tail vertebræ, $7\frac{3}{4}$ inches; of tail, with hairs, 10 inches; height of ear, half an inch; hind foot, $2\frac{5}{8}$ inches." (Aud. and Bach.)

This species was described by Bennett from a specimen collected in western Mexico, and has not yet been fairly established as an inhabitant of the United States. It has a very close resemblance to *S. grammurus*, and may possibly prove the same, though I have seen none of this last mentioned species with the black crown, nor is any mention made by Bennett or Audubon and Bachman of the purer gray of the anterior part of the body. I have already suggested the possibility that the specimen from Los Nogales (No. 1046) may be different from *S. grammurus*, and belong to this species, but, as its colors have been altered by immersion in alcohol, it is impossible now to decide.

? SPERMOPHILUS CLARKII. Western America.

This supposed species has already been discussed under the head of *Sciurus clarkii*, page 279. Its reference, by some authors, to the genus *Spermophilus* rather than to *Sciurus*, is scarcely warranted by the vague description of Hamilton Smith.

CYNOMYS, Raf.

Cynomys, RAFINESQUE, Am. Month. Mag. II, 1817, 45.

BRANT'S Muizen, 1827, 171.

Anisonyz, RAFINESQUE, Am. Month. Mag. II, 1817, 45 (Based on an erroneous interpretation of a description by Lewis and Clark.)

Cheek pouches very rudimentary; tail and ears very short. Five distinct claws to all the feet. Molars very large; their lines strongly divergent anteriorly, closely approximated behind. First upper molar as large in horizontal section as the second. Skull very broad, the lines of the zygomata strongly convergent anteriorly. Pupil round.?

The prairie dogs of America are characterized by various peculiarities which separate them from the genera *Arctomys* and *Spermophilus*, although they have been placed in both. The genus *Cynomys* was established by Rafinesque, in 1817, and has priority even over *Spermophilus*.¹ In the character of the cheek pouches the resemblance to *Arctomys* is much closer than to *Spermophilus*; these are (in the alcoholic specimen) about one third of an inch deep and very shallow, very little deeper, if at all, than what is observable in the *Arctomys monax*. In *Spermophilus*, on the contrary, the pouches extend back as far as the eyes, and even, in some species, to the occiput. The thumb, though short, is quite distinct and carries a well developed claw. The tail is short, from one-fourth to one-seventh the length of the body.

The skull of *Cynomys* is remarkably broad and short, the extreme width equal to the length, exclusive of the snout. The muzzle is slightly compressed and quadrangular. The nasals are slightly concave on their external border, narrowing behind; the nasal process of the upper maxillary broad, with parallel sides; the suture of the frontal bone, with the maxillary, intermaxillary, and nasal, almost in the same transverse straight line. The dorsal outline of the skull is gently convex, the edges of the orbit elevated somewhat, so that a transverse section between the orbits would be concave. The post-orbital processes of the frontal bone are very highly developed, the posterior border nearly in a straight transverse line, though slightly subulate. The cranium is broad and depressed. The posterior extremities of the zygomatic arch are much further apart than the anterior, the convergence anteriorly being such that the lines would meet at about half the length of the skull, in advance of the snout.

The free portion of the zygoma is of greater length than in the other *Sciurinae*, and the direction of the anterior edge of the zygomatic process of the maxillary less oblique. The anterior face of this process is also much more deeply excavated, so that it has a distinct exterior and overhanging wall. The ante-orbital foramina are quite large, though far forward; they are elongated and strongly divergent below, so that the thin plate of bone which bounds them exteriorly has its edge parallel with that of the zygomatic process of the maxillary. The tubercle at the lower end of this foramen is much larger than usual and is distinctly visible when viewed from above, projecting beyond the superior outline of the skull, which is not the case in any American species of the allied genera.

The incisive foramina are moderately large and bounded posteriorly by the edge of the maxillary, which is considerably nearer the molars than the incisors. The palato-maxillary foramina are on the suture of these two bones. In consequence of the great contraction of the palate posteriorly, the foramen behind the last molar is very much reduced in size.

¹ Should the two genera be necessarily united, in any event *Cynomys* would have to be retained, as having priority.

The most striking peculiarities, however, of this genus are discernible in the molars. The outlines of the molar series, instead of being nearly straight and parallel, as in *Arctomys*, or curved with parallel chords, as in *Spermophilus* and *Sciurus*, are curved and very strongly divergent anteriorly and approximated behind. Thus the narrowest part of the palate is between the fifth molars, and measures only half as much as the widest portion between the first. There is only a slight approximation to this anterior divergence in *Spermophilus*. The molars, too, are very large, and occupy a long interval of the skull, equal to more than one-fourth of the total length, while in *Arctomys* and *Spermophilus* this space is less than one-fifth. The interval between the anterior molar and the incisors is less than the length of the line of molars, while in *Arctomys* and *Spermophilus* it is considerably greater.

The first upper molar is very nearly as large as the second, particularly in the section made by a horizontal plane. It, however, has but one root, and is inserted obliquely forwards and inwards; its crown is peculiarly marked by a compressed crest rising at an angle with a lower ridge on either side, separated by a narrow valley; these are parallel with the central one. The general direction of these ridges is forwards and inwards, and their lines, if produced, would meet in the middle of the incisive foramina, instead of being nearly transverse, as in some *Spermophilus* and *Arctomys*. The second, third, and fourth molars increase but little in size posteriorly, and are more narrowed internally than in the allied genera. The fifth, however, is much larger and in the shape of a quarter circle, with the two perpendicular radii forming the anterior and interior margins of the tooth. Its surface exhibits three distinct valleys, instead of the two usually seen in the slightly worn tooth of the *Sciurinae*.

The lower molars correspond in development to the upper. They are shorter in proportion to their width than in other *Sciurinae*, especially the first, while the reverse prevails in the last molar, which is considerably longer than wide. Viewed laterally, the anterior lobe of each tooth is much larger, higher, and more pointed than the posterior, while in other *Sciurinae* these are of nearly equal height. The shape of the jaw, too, is different.

The upper incisors are large and considerably rounded on the external angle. They are twice as deep as broad, with faint shallow striæ on the anterior face. The enamel shows laterally on about one-third of the side of this incisor. In *Arctomys*, the incisor is nearly as broad as deep, and the enamel covers more than half the side.

From the above description it will be seen that the skull of this genus differs very greatly from its allies, more, indeed, than any of these do among themselves. In the totality of characters the approximation to *Arctomys* is considerably the closest. From this and *Spermophilus* it differs in the divergence anteriorly of the line of molars; the great size of the molars, especially the first; the greater size and complexity of the posterior upper one; the strong convergence anteriorly of the zygomata, &c.

The ears of this genus are very short, in fact, nearly rudimentary. The eyes are moderately large. The tail is short, one-fourth to one-eighth the length of body, thinly haired, and the lateral hairs longest. The body is very thick and squat. The feet are large; the claws well developed; those on the forefeet much larger than the hinder ones, and distinctly five in number; that on the thumb unusually large. The pupil of the eye, in an alcoholic specimen, appears slightly vertical, but it seems circular in a living animal. The ridges of the palate are considerably more numerous between the molars than the molars themselves. The pouches are very shallow, and do not extend much deeper than in *Arctomys*, not as far back as the eye, or scarcely half an inch.

CYNOMYS LUDOVICIANUS.

Missouri Prairie Dog.

Arctomys ludovicianus, ORD, Guthrie's Geog. 2d Am. Ed. II, 1815, 292, 302.

SAY, in Long's Exped. R. Mts. I, 1823, 451.

HARLAN, F. Am. 1825, 160.

GODMAN, Am. N. H. II, 114.

GRIFF. Cuv. III, 1827, 198. (Plate taken from Lewis and Clark's specimen in Peale's Museum.)—IB. V, 1827, 247.

PRINCE MAX. Reise in das innere Nord-Amerika, I, 1839, 365.

WAGNER, Suppl. Schreber, III, 1843, 261.

Spermophilus ludovicianus, "LESSON, Manual, 244, 658."

F. CUVIER, Suppl. Buffon, I, Mam. 1831, 316

AUD. & BACH. N. Am. Quad. II. 1851, 319; pl. xcix.

KENNICOTT, Rep. U. S. Pat. Off. Agricultural for 1856, (1857,) 81; pl. ix.

Cynomys socialis, RAFINESQUE, Am. Month. Mag. II, Nov. 1817, 45.

BRANTS, Muizen, 1827, 171, (from Raf.)

LESSON, Nouv. Tab. R. An. 1842, 115.

Cynomys grisea, RAFINESQUE, Am. Month. Mag. II, Nov. 1817, 45.

BRANTS, Muizen, 1827, 172, (from Raf.)

Arctomys griseus, FISCHER, Synopsis, 1829, 345.

"*Arctomys missouriensis*, WARDEN, Desc. U. S. V. 1820, 627."

Arctomys latrans, HARLAN, F. Am. 1825, 306.

Barking Squirrel, LEWIS and CLARK, II, 1815, 175.

Size of fox squirrel, *Sc. vulpinus*, but heavier; ears very short, not projecting above fur. Tail short, with the hairs, about one third the length of body. Claws long, very stout; the thumb of fore feet armed with a long claw instead of a flat nail. Soles with a patch of hair. Color above reddish brown or cinnamon, with the tips of the hairs lighter and with scattered black hairs interspersed; beneath brownish white or yellow. In winter of a more grayish cast above. Hairs on the upper part lead color at base, then pale cinnamon white to cinnamon. Tail like the tack, its tip black, with the hairs light colored at base. Length about 12 inches; tail, with hairs, 4; hind foot about 2.25 inches.

This species, in external form and terrestrial habits, approaches the true marmots, as it does likewise in its internal structure. The cheek pouches are small and not easily detected, even in a fresh specimen. The body is stout and clumsy, a woodchuck (*Arctomys monax*) in miniature. The ears are very short, with scarcely any rim whatever, and this not projecting beyond the short fur. The septum of the nose is naked; the hairs elsewhere come almost into the nostrils. The fore feet are large, and the thumb is armed with a strong claw as long and stout as that on the fifth or exterior finger. The third finger is largest; second and fourth nearly equal, and the claw of the fifth does not reach to the base of the claw of the fourth. The third toe is longest; the fourth but little shorter; the second reaches to the middle of the claw of the third; the fifth not to the base of that of the fourth; nor the first to that of the fifth. The palms are naked; the soles nearly so, with the exception of a central patch under the base of the metatarsus. The tail is short, usually about one-third the body, sometimes not more than a fourth; it is covered nearly uniformly everywhere (with but a moderate degree of flattening) with stiff hairs.

The prevailing colors of this animal in summer are reddish brown, almost a light chestnut or cinnamon, turning gradually into brownish yellow on the sides, and lighter tint of the same beneath, without any distinct line of demarcation anywhere. A closer examination above, however, shows that the reddish brown is tipped with a paler tint of the same or of brownish yellow, and that there are numerous black hairs interspersed. The hairs individually are very

dark plumbeous at the extreme base, then very pale cinnamon, then reddish brown as described; the latter of greatest extent. There is considerable difference, however, in different specimens as to the amount of the pale color at the base of the hairs; in some this being displaced by the reddish brown. The hairs beneath are brownish at the base posteriorly; anteriorly they are generally uniform pale brownish yellow throughout. The whiskers and edges of the eyelids are black; the iris is also black. The tail generally is colored like the back; for one-third or one-half from the tip it is black; the hairs being reddish white at the base, and some of them tipped with the same.

In examining a large series of prairie dogs collected at different seasons, it will be seen that, as a general rule, they are much brighter colored in summer, in some cases of a bright rusty or brick red; the tips of the hairs lighter. These tints become paler towards the winter, fading in a measure to a grizzled yellowish gray and dull light brown. The fur becomes fuller and softer in every way. In summer the sole is generally naked, except an isolated patch of greater or less extent in the centre; in winter this patch increases in size, though generally separated by a narrow line from the hairs on the sides of the feet and on the heel.

In winter specimens the under fur is very dark sooty plumbeous, then pale yellowish or cinnamon white for most of its extent, and tipped with various shades of reddish brown. In all cases the under parts are much lighter than the upper; sometimes they are of a brownish silver gray, sometimes with a tinge of yellowish rusty, either continuously or in patches.

From the accompanying list of localities it will be seen that the prairie dog has a very extensive distribution, being found over the entire extent of the region between the Missouri River and the Rocky Mountains. It has not been hitherto recorded as occurring north of the United States line, as Richardson does not mention it as an inhabitant of the Saskatchewan. Southward it extends to the Rio Grande, certainly as far as the vicinity of Presidio del Norte, in latitude 30°; it is probable, however, that it does not reach as far south on the river as Matamoras, as Dr. Berlandier does not mention it in his notes on the zoology of that region.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.							Collected by—		
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore ft.		Length of hind ft.	Weight in lbs.
2191	*	.....	Milk river, Nebraska.....	Aug. 18, 1853	Gov. I. I. Stevens.....	.....	Skin.....	.....	.....	2.75	12.00	3.00	4.00	.....	.....	.....	Dr. G. Suckley, U.S.A.
2540	.....	.....	.....do.....	do.....	do.....	.....	In alcohol.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
190	.....	.....	Upper Missouri.....	.....	Dr. J. Evans.....	.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1325	.....	.....	.....do.....	1854.....	Col. A. Vaughan.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Dr. F. V. Hayden.....
1326	.....	.....	.....do.....	1854.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1528 to 1546 ²	.....	.....	.....do.....	1855.....	Dr. F. V. Hayden.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1815 ³	.....	♂ ♀	Yellowstone river.....	Aug. 10, 1856	Lt. G. K. Warren, U. S. Army.....	D	do.....	1.13	2.38	2.90	11.00	2.63	3.38	.....	2.25	1	do.....
1816 ³	.....	.....	.....do.....	do.....	do.....	C	do.....	1.25	2.63	3.25	13.00	3.00	3.88	2.00	2.25	1½	do.....
1817 ³	.....	.....	.....do.....	do.....	do.....	A	do.....	1.13	1.40	2.75	11.00	2.75	3.75	2.00	2.25	1½	do.....
776	.....	♂	Fort Pierre, Nebraska.....	.....	Dr. J. Evans.....	.....	do.....	1.30	2.50	.....	.....	2.46	3.70	1.95	.....	.....	Dr. F. V. Hayden.....
3541	.....	.....	.....do.....	.....	Col. Vaughan.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
575	.....	.....	.....do.....	.....	Th. Culbertson.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
647	1798	.....	.....do.....	.....	Dr. Hayden.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
960	.....	.....	.....do.....	.....	Dr. J. Evans.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
777	.....	.....	.....do.....	.....	.....do.....	.....	In alcohol.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
778	1814	.....	.....do.....	.....	.....do.....	.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1803 ³	2500	♀	Fort Randall, Nebraska.....	Oct. 15, 1856	Lt. G. K. Warren, U. S. Army.....	F	.....	1.25	2.50	3.50	13.00	4.00	5.00	2.00	2.38	2	Dr. F. V. Hayden.....
1804	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1805	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1806	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1807	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1808	2501	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1809 ³	2502	♂	do.....	do.....	do.....	M	do.....	1.13	2.25	3.25	12.50	3.25	4.25	1.75	2.25	1½	do.....
1810	2503	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1811	2504	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1812 ³	2505	.....	.....do.....	do.....	do.....	G	do.....	1.13	2.25	3.25	12.25	3.13	4.13	1.75	2.13	1½	do.....
1813	2506	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1814 ³	2507	.....	.....do.....	do.....	do.....	K	do.....	1.13	2.25	3.25	11.25	3.00	3.90	1.50	2.25	1	do.....
1801	2498	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1802	2499	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1818	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1819	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1820	.....	.....	.....do.....	do.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....

¹ Measurements made by Dr. Suckley before skinning.² Twenty-one specimens.³ Measurements made by Dr. Hayden before skinning.

List of specimens—Continued.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—		
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore fl. length.	Hind fl. length.		Skull, length.	Skull, width.	Weight in lbs.
			Fort Randall, Neb ¹	Oct. 15, 1856	Lt. G. K. Warren, U. S. A.	B	Skin	1.40	3.00	3.50	13.25	2.63	4.00	2.13	2.38		2½	Dr. F. V. Hayden.
			do.	do.	do.	E	do.	1.25	2.50	3.50	12.50	4.00	4.75	2.00	2.25		2½	
			do.	do.	do.	H	do.	1.13	2.95	3.25	12.00	3.00	4.00	1.75	2.13		1	
			do.	do.	do.		do.	1.13	2.95	3.25	12.25	3.13	4.13	1.75	2.00		1½	
			do.	do.	do.	L	do.	1.25	2.50	3.25	13.00	3.25	4.25	1.75	2.25		2	
			do.	do.	do.	N	do.	1.13	2.95	3.25	12.00	3.25	4.00	2.00	2.25		1½	
1904	2602	♀	Republican river, Neb.	Oct. 16, 1856	Lt. F. T. Bryan, U. S. A.	382	do.		3.00		11.00	3.00	3.75					W. S. Wood.
1914		♂	do.	Oct. 7, 1856	do.	373	In alcohol.		4.00		11.50	3.25	4.50	1.65	2.40			do.
1905	2603	♀	Medicine Bow Butte	Aug. 7, 1856	do.	225	Skin		2.25		11.00	2.75	3.25					do.
499			Greenhorn Mts., Rocky Mts.		Capt. Beekwith, U. S. A.	3	do.											Kreutzfeldt.
500			Llano Estacado, Tex.		Capt. J. Pope, U. S. A.		do.											
1715			Pecos river.	May 25, 1855	do.	71	do.											
1716			Head of Devil's river.	May 10, 1855	do.	74	do.											
1717			Pecos	Apr. 24, 1856	do.	192	do.											
339	1256		Jornada del Muerto, N. M.		Capt. A. W. Whipple, U. S. A.	12	do.											Dr. C. B. Kennerly.
354	1268		do.		do.		do.											do.
1054	2214		Devil's river, Tex.		Maj. W. H. Emory, U. S. A.		do.											do.
1035		○	San Luis Springs, N. M.	April, 1855	do.		In alcohol.	.80	1.50	1.70		1.00		1.00	1.30			do.
161	1144		Limpco Mts., Pres. del Norte.		do.		Skin									2.50		J. H. Clark.
498	1634	○	San Antonio to El Paso		do.		Skeleton											do.
1651			Fort Chadbourne, Tex.		Dr. E. Swift, U. S. A.		do.											
	1349		Fort Kearny		Dr. W. Hammond, U. S. A.		Skull.									2.55	1.76	
	1350		do.		do.		do.									2.57	1.94	
	1890		Fort Belknap, Tex.		Capt. Marcy, U. S. A.		do.											
	1160		Red River, Ark.		Dr. Shumard.		do.											

¹ These are probably included in the preceding list of specimens from Fort Randall. As I have not been able to assign the numbers, however, I repeat them, to preserve Dr. Hayden's recent measurements.

CYNOMYS GUNNISONII, Baird.

Short-tailed Prairie Dog.

Cynomys gunnisonii, BAIRD, Pr. A. N. Sc. Phil. VII, April, 1855, 334.

?? *Arctomys columbianus*,¹ ORD, in Guthrie's Geog. 2d Am. ed. II, 1815, 292, 302.

?? *Anisonyx brachyura*,¹ RAF. Am. Month. Mag. II, 1817, 45.

?? *Arctomys brachyura*,¹ HARLAN, F. Amer. 1825, 304.

FISCHER, Synopsis, 1829, 345.

?? *Burrowing squirrel of Columbia*, LEWIS and CLARKE, II, 1815, 173.

SP. CH.—Size less than that of the *S. ludovicianus*, general proportions similar. Ears very short; thumb armed with a well developed claw. Tail short, the vertebral portion less than one-sixth the length of the body, with the hairs, less than one-fourth. Color above rather light liver brown, mixed intimately with ash, light brown, and black; beneath pale yellowish brown. Tail white along the edges and at the tip, with a subterminal margin of black; the hairs at the tip are white to the base, with a narrow central bar of black. The black bar sometimes wanting.

In general appearance this sphermophile approaches to the *S. ludovicianus*, or prairie dog, although a comparison with many specimens of the latter shows constant and sufficient distinctive characters. Its size is somewhat less.

The body is thick and comparatively short, the head very broad. The septum of the nose only is naked. The whiskers are black, and not so long as the head. The ears are very short, forming only a narrow rim around the auditory aperture; they are thickened and densely covered with hair, except inside. They are somewhat larger than those of *S. ludovicianus*, and very similar to those of *S. franklini*. The feet are weaker than those of *S. ludovicianus*. The claws are very long and slightly curved. The thumb is armed with a stout claw, (not nail,) as large as the fifth claw would be with the tip broken off. The third finger is longest; the fourth a little shorter than the second. The fifth extends barely to the base of the claw of the fourth. The palms are naked. The proportions of the toes are much as in *S. ludovicianus*, though absolutely they are decidedly smaller. The soles are naked, with a patch of long hairs in the centre.

The tail is very short, less than that of any species known to me, the vertebræ (in No. 501) being scarcely one-ninth of the length of the body. It is covered rather densely with hair, and is much flattened.

The upper portions of the body are black, pale brownish white, gray and brown intimately mixed or mottled, without any appearance of spots or bars. Anteriorly these colors have less black, posteriorly more grayish. The under parts are of a light brownish yellow, darker on the legs, lighter under the head and on the throat. The predominance of black hairs on the crown almost gives rise to a black patch, invaded, however, by brownish gray; the eyelids are colored like the belly. On the upper parts the hairs are dark lead color at the base, then ashy white for most of their length, then light brown, with the tips much lighter. The soft concealed fur is ashy white to the tips; interspersed are many hairs entirely black. Anteriorly the basal lead color is almost wanting, posteriorly the ashy white becomes purer and more distinct. The hairs beneath are dark lead colored at the base, less distinct anteriorly. The tail, for its basal half, is like the back, otherwise it shows a mixture of black and white, with a broad and uninterrupted border and tip of pure white throughout, except towards the base, where this becomes yellowish. The hairs at the end of the tail are pure white throughout, except a well defined and narrow ring of black in the centre, for about one-eighth of an inch; in fact, this subterminal black border can be traced for nearly the whole length of the tail.

¹ Based on the description by Lewis and Clark, as mentioned below.

This species may be readily distinguished from its nearest representative, *S. ludovicianus*, by its somewhat less size, much shorter tail, which is white (not black) at the tip, weaker feet, &c. The prevailing color is not light reddish brown, but rather a liver brown, and the mixture of the different colors much finer. The fur generally is much softer. From *S. franklini* it differs by larger size, much shorter tail, much larger thumb nail, and general colors, exhibiting none of the yellowish brown gloss of the upper parts, nor the distinct spotting of black.

The skull differs materially from that of *S. ludovicianus* in being shorter and broader, the molars more parallel, with other characteristics only distinctly intelligible from a figure.

Since preparing the preceding description, based upon No. 501, two specimens of a short, white-tailed prairie dog have been received from Lieutenant Bryan, which possibly belong to the same species. They are quite similar to Captain Beckwith's specimen in general character, the very short tail, &c. This is, however, entirely white for two-thirds its length; the basal third being like the back. The terminal hairs of the tail are pure white, and in none is there any annulation of black whatever. The prevailing tint, even in the midsummer specimen, lacks the red aspect of *C. ludovicianus*, the predominant color above being a brownish yellow, grizzled with paler, the lower parts a pure brownish yellow. The August specimen is darker above, with more black hairs intermixed. The tails of these specimens are more cylindrical than in No. 501; their proportions to the body and colors are also somewhat different, and it is quite possible that the two may be really distinct, and that the one from Coosachetope Pass belongs to a species which has its headquarters somewhere in the Great Basin.

Lewis and Clark mention a burrowing squirrel from the plains of the Columbia which appears to be a *Cynomys*, and may possibly be the same with the species here described; or, if two be indicated, as is quite possible, then the specimens of Lieutenant Bryan might be referred to the animal of Lewis and Clark, under the name of *columbianus*. There are, however, important discrepancies between the description of the above authors and the Smithsonian skins not readily reconcilable. Thus: "the two inner toes of the fore feet are remarkably short, and are equipped with blunt nails; the remaining toes on the front feet are long, black, slightly curved, and sharp pointed." Here it is uncertain whether the authors refer to two inner toes of one foot only, making the first and second,¹ or, as is most likely, whether they mean the innermost *one* of two, making the inner front toes for each animal. At any rate the inner toes are said to be remarkably short and equipped with blunt nails, the remaining toes being long. This, if the meaning of the author is to be taken in its precise signification, is very different from the species here described, in which the inner toe is quite large, and armed with a conspicuous claw, nearly as large as most of the others, instead of having a blunt nail. This is, however, a matter of much uncertainty. "The under parts are of a light brick red, the upper of a brown gray, with a slight tinge of brick red; the long hairs of the back of a reddish white." There is nothing whatever of this brick red in the skins before me, the under parts being brownish yellow, even in summer specimens. "The head and body are $12\frac{1}{2}$ inches; the tail is $2\frac{1}{2}$, flat, depressed, with the hairs inserted on the sides, the margin white, the bases of the hairs fox red." (No mention of a black median band.)

Should any of these white-tailed prairie dogs ever show a brick red color, I would have little hesitation in referring one of them to the *Arctomys columbianus*, although, as stated,

Rafinesque has based his genus *Anisonyx* upon this interpretation of the meaning of Lewis and Clark.

the summer specimens exhibit no trace whatever of it. The *arctomys lewisii* of Audubon and Bachman come much nearer in point of color to the description of Lewis and Clark. It may be that there is a permanently reddish species on the Columbia, and, as I have already stated, I consider it by no means improbable that Captain Beckwith's specimen may be specifically different from those of Lieutenant Bryan, which would make three in all.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.										Collected by—
								Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Longest fore claw.	Longest hind claw.	Skull, length.	Skull, width.	
501 1636			Cooachetope Pass, Rocky Mts.	.....	Capt. E. G. Beckwith.	22	Skin.....	....	11.00	1.25	1.92	1.75	1.84 ¹	.50	.33	....	....	Mr. Kreuzfeldt.
1903 2601		♂	Pole Creek, Neb.	July 30, 1856	Lt. F. T. Bryan..	178	..do .....	....	10.50	1.85	2.30	....	2.00	....	....	2.24	1.56	W. S. Wood.
1913		♀	Medicine Bow Creek, Neb.	Aug. 28, 1856	do	312	Skin in alc	3.50	13.50	1.75	2.50	1.55	2.20	.52	.35	....	....	

¹ Probably too short.

² Skin stretched.

ARCTOMYS, Schreber.¹*Arctomys*, "SCHREBER, Säugthiere, IV, 1792."

AUD. & BACH. N. Am. Quad. I, 1849, 16.

Sp. Ch.—Size large; body very thick and depressed; thumb very rudimentary, armed with a small flat nail, not a claw; soles entirely naked; cheek pouches very shallow; pupil rounded?

It is in this genus that we find the largest members of the *Sciurinae*, some of them, indeed, taking the second or third rank in size among North American rodents, being exceeded only by *Castor* and *Hystrix*, and one species of hare, the body is thick and massive, the ears distinct and well shown above the fur, though short and rounded. The tail is bushy and full, but nearly cylindrical, the hairs being as long above and below as laterally. The thumb is rudimentary, with a short flat nail, not a claw. The outer finger of the hand extends as far as two-thirds the length of the palm, and in all the feet the claw of the outer toe reaches beyond the base of the one next to it.

The skull is much more flattened than in the spermophiles, in fact its upper outline is not only nearly straight, but it is decidedly concave between the orbits. The post-orbital processes are very large, the distance between their apices equal to the greatest width of the back part of the head; their posterior margin is rectilinear and perpendicular to the axial line of the skull, until it passes gently into the temporal ridge of the parietal bone, which is quite prominent and concave externally. There is a distinct semicircular notch behind the subtubercular ante-orbital process of the frontal; the nasal bones extend back nearly as far as this notch. The malar bone is twisted angularly, and shows externally three principal faces; anteriorly, it is wedged between the maxillary and the lachrymal bones. The palate is broad and rather plane, though flattened concave between the molars—the bottom of the palate on a level with the inferior edge of the root of the zygoma. The external outlines of the upper molars are rectilinear and parallel in the adult—curved in the young; the inner outlines are slightly divergent anteriorly in the young. The plane of the grinding surface is nearly horizontal at first, but twisted outwards more and more obliquely behind. There is no very essential difference in the shape of the lower jaw of *Sciurus* and *Arctomys*.

The incisors are much less compressed than in *Sciurus*, considerably rounded anteriorly and laterally; the enamel extends half way round the side. There are faint indications of numerous fine striæ on the enamel. The crown of the anterior upper molar is about half the area of the second, and its summit is on the same level with the rest. The other teeth are nearly equal, but increase gradually posteriorly. The first molar has one root, the others three, each; the crown of the first molar, in its most perfect state, exhibits a semicircular marginal ridge on the inner, anterior, and posterior sides, thus encircling nearly three-fourths of the crown; within this curve rises a transversely elongated tubercle.

In the young skull the deciduous first upper molar is much smaller than its successor; the crown however, is not a simple conical tubercle, but shows a distinct longitudinal ridge, with a pit on either side; in this case, however, the direction of the ridge is nearly with the line of

¹ This is the authority given by Agassiz in *Nomenclator Zoologicus*. I find the name used, however, by Gmelin, in 1788. It is probable that Schreber made it in one of the earlier numbers of his volume IV, which was not completed nor furnished with a title until 1792.

the molars. The deciduous second molar is longer than broad, the reverse being the case in its successor; in other respects they are not very dissimilar. The first two upper molars are not replaced until the animal is more than two-thirds grown.

The preceding description of the characters of the skull of *Arctomys* is derived chiefly from undoubted specimens of *A. monax*. An immature skull from Wisconsin, (1679,) at first supposed to be the same, differs in some very essential points, especially, however, in the size of the teeth. Compared with a skull of *A. monax*, from Essex county, New York, of the same age, but a little longer, although the incisors are smaller, the molar teeth are found to be larger in every way. Thus the three posterior teeth measure nearly as much as four in the other skull. The molars thus extend further forward as well as backward in the Wisconsin specimen. The palate between the posterior molars is narrower, but between the anterior ones is of the same width.

It is, perhaps, erroneous to say that *Arctomys* is without cheek pouches. In *A. monax* there is a distinct indentation on the side of the jaw inside, extending to a depth of perhaps half an inch.

ARCTOMYS MONAX.

Woodchuck; Ground Hog.

Mus monax, LÆNNÆUS, Syst. Nat. (10th ed.) I, 1758, 601.—IB. (12th ed.) I, 1766, 81.

BODDAERT, Elenchus Animalium, I, 1784, 105.

Glis monax, ERXLEBEN, Syst. 1777, 361.

Arctomys monax, GMELIN, Syst. Nat. I, 1788, 142.

SHAW, Gen. Zool. II, 1801, 117, (from Pennant.)

DESMAREST, Mamm. II, 1822, 328.

SABINE, Linn. Trans. XIII, 1822, 582.

HARLAN, F. Amer. 1825, 158.

GRIFFITH's, Cuvier, III, 170; plate (from Lawson).—IB. V, 1827, 244.

RICHARDSON, F. B. Am. I, 1829, 153; (from Godman.)

GODMAN, Am. N. H. II, 100.

DE KAY, N. Y. Zool. I, 1842, 68; pl. xxi, f. 4.

AUD. & BACH. N. Am. Quad. I, 1849, 17; pl. ii.

KENNICOTT, Rep. U. S. Pat. Office, Agricultural for 1856, (1857,) 82; pl. x.

Glis canadensis, ERXLEBEN, Syst. An. 1777, 363. (Quebec Marmot, of Pennant.)

Mus empetra, PALLAS, Nov. Spec. Glir. 1778, 74.

BODDAERT, Elenchus Anim. I, 1784, 105.

Arctomys empetra, SCHREBER, Säugethiere, IV, 1792, 743; pl. ccx.

SHAW, Gen. Zool. II, 1801, 119.

GMELIN, Syst. Nat. I, 1788, 143.

DESMAREST, Mamm. I, 1822, 329.

SABINE, Linn. Trans. XIII, 1822, 584.

HARLAN, F. Amer. 1825, 159.

GRIFFITH's Cuvier, V, 1827, 245.

RICHARDSON, F. B. Amer. I, 1829, 147; pl. ix.

FISCHER, Synopsis, 1829, 343.

GRAY, Knowsley Menagerie, 1846; pl. vii.

"*Marmota quebekana*, PENNANT, Syn. 270," (as quoted by Pallas.)

Arctomys melanopus, KÜHL, Beiträge, 1820, 64. (Canada.)

FISCHER, Synopsis, 1829, 343.

Arctomys marmota canadensis, KÜHL, Beiträge, 1829, 64.

FISCHER, Synopsis, 1829, 341.

Maryland marmot, PENNANT, Synopsis Quad. 1771, 270.—*Id.* Hist. Quad. 1781, No. 260.—*Id.* Arctic Zoology, I, 1784, 111.

Quebec marmot, PENNANT, Synopsis, 1771, 270.—*Id.* Hist. Quad. 1781, No. 259.—*Id.* Arctic Zool. I, 1784, 111.

Monax gris, ST. HILAIRE & CUVIER, Hist. des Mammif. III, 1819; plate and text.

SP. CH.—Tail, with the hairs, about half as long as the body and head, or a little less. Color varying from nearly pure black all over to grizzled above, and bright chestnut red beneath. Feet always black, or dark brown. Tail usually black, sometimes annulated grayish. Length, 15 to 18 inches. Hind foot over 3 inches.

Description of specimens before skinning (847, 854).

Form very thick and clumsy. No constriction at the neck, which is short, the head set apparently directly on the shoulders. Head broad, flattened above. Legs short and thick. Tail short, full, and bushy, somewhat flattened; the tips of the hairs reaching a little beyond the ends of the claws of the outstretched feet. Fur of two kinds—the basal soft and moderately close, the longer projecting beyond the basal fur half the length of the latter, composed of stiff lustrous hairs; the tail entirely of the latter kind, without any soft fur. Annulations are distinctly visible on the skin of the tail on separating the hairs.

Head broad and full. Centre of the eye midway between the tip of the nose and the posterior margin of the ear. Nose broad, the muffle covered with hair to the edge of the nostrils; the broad septum between them, with the inside of the nostrils themselves, naked and black. The upper lip is divided vertically by a broad shallow furrow, running up and bisecting the septum. This is naked throughout. The lower end of this furrow is occupied by an angular cartilaginous pad, which lies over the base of the incisors. The lips are very full and fleshy; the upper ones inflected into the cavity of the mouth, with its coating of hairs, the boundary of which is marked by a fringe of short bristles. The lower lip is not attached to the end of the jaw, but may be slipped down for a distance equal to the length of the incisors.

There is a short shallow cavity between the muscles of the jaw and the cheek, attaining a depth perhaps of half an inch or less, and occupying the place of the internal pouch of *Tamias* and *Spermophilus*. The inner edge of this is covered by a cartilaginous roughened pad, which extends backwards so as when the molars are in apposition, to lie against their line of junction.

The cheek whiskers are in five horizontal series on each side, nearly parallel, the upper somewhat divergent. There are about five large hairs in each series, though sometimes two spring from the same root, and there are in the lower rows some feebler ones anterior to the larger ones. All, however, are short, and do not extend back to the ear. Another set of whiskers (four hairs in the set) is seen above the anterior canthus of each eye, extending obliquely upwards and backwards. On each cheek, again, and about as distant from the eye and ear as these are from each other, is a clump of long hairs, about five or six in number. The tips of these reach some distance behind the ear. There is also a tuft of bristles under the chin, as well as some scattered shorter ones in advance of these and near the edge of the lip.

The eyes are rather small, the pupil nearly or quite circular, the iris liver brown. In the anterior canthus is a small thin cartilaginous and triangular flap, which is directed backwards over the base of the eyeball. It is firmer and black at tip.

The ears are short, broader than their projection above the skull. The upper edge is subtruncate, the corners rounded or rather it forms the arc of a rather large circle. It has no appreciable antitragus, and is coated with short hairs on both sides. It scarcely projects above the hairs of the nape, though very distinctly visible from the sides.

The feet are rather large, the palms and soles entirely naked; the latter from the heel and well wrinkled. There are five callosities on the palm—three anterior, and two posterior much larger. Of the former, the outer ones are situated at the base of the outer (longer) fingers; the central one between the bases of the two central long toes, (third and fourth.) This is largest and as if formed by the confluence of two situated like the others. On the soles there are six callosities or tubercles—four anterior over the bases of the toes, except the third, which is larger, and between the bases of the third and fourth. The two posterior are very low and scarcely appreciable.

The thumb of the hand or fore foot is excessively rudimentary, like a mere wart, and would be scarcely appreciable but for the broad, short nail, with its subjacent pad. The fore claws are considerably longer than the hinder ones. In the hand, the claw of the third finger projects furthest; the fourth comes next, reaching nearly as far as the third; the second is a little shorter. The claw of the fifth extends as far as the end of the fourth finger.

The second and third toes of the hind foot, with their claws, are about equal and longest; the fourth is a little shorter. The claws of the first and fifth do not quite reach the last articulation of their adjacent toes. The tip of the claw of the first toe extends about as far as the middle of the fifth claw. There is a slight web at the base of the fingers and toes.

On slightly everting the anus (of the male) there are visible, just within its inner edge, three glandular papillæ—one anterior, and two lateral—themselves capable of considerable protrusion (one-fourth of an inch) by eversion, when they are conical, and white and like the teats of a cow. During life these may frequently be seen in a state of constant protrusion and retraction, at first sight giving the impression of large ascarides. These appear to secrete a thickened matter, white, and of a slightly offensive smell.

The stomach is simple, shaped much like that of man; the coecum is very large and full, in shape and size not dissimilar to the stomach; no partitions distinguishable. The gall bladder is distinct.

The predominant color of the outer surface of the hair of the specimen is a lustrous deep black, especially on the hinder part of the back and belly, the tail, legs, the nape, and top of the head. On the shoulders, sides of the body and neck, cheeks below the eyes, whole under parts, except posteriorly, there is a strongly distinct hoariness, caused by a subterminal space of silver grayish white, which, on the under parts of the body and legs, passes gradually into a brownish chestnut, (the mesial line of the belly lighter.) There is also a distinct ring of whitish round the muzzle, the posterior edge of which is about half way between the eye and nostril, or perhaps the muzzle may be described as grayish white, excepting the extreme end, which is black.

The above remarks respecting color apply, however, exclusively to the long coarse hairs. The intermediate soft hairs are generally of a dark plumbeous black at the base, and of a tinge of whitish at the tip, varying with the region from light brownish to dull gray, through chestnut, darkest towards the ends of the hairs. The chestnut tinge predominates on the posterior half of the body. On the sides of the body, anteriorly, these hairs are more annulated, there being a second dark bar separated from the basal one by a somewhat lighter one, making four rings, the terminal one again almost divided into one grayish and one reddish white. The basal fur on the belly is, however, very scant and mostly black. The hairs on the tail are entirely black. The incisors are white.

Another specimen, from the same litter in all probability, differs in having all the long hairs

on the upper parts and sides of a pale yellowish hoary, instead of being black. The top of the head is dark brown, except on the muzzle, which is black; there is, however, a subterminal band of grayish white, as described. The feet and tail are entirely black. The bases of all the hairs in this specimen are almost black. In this, though a male, the teats are distinctly discernible to the number of four on each side—two on the groin, one inside of the shoulder, and one behind the axilla. There are none visible on the belly.

We thus see that this species varies very considerably in the color of the lower parts, and to a less extent in the upper; nor is the color a question of age, as very large specimens are as different as half grown and young ones. The principal variations before me are as follows:

1. Almost entirely glossy jet black all over. On the back, however, the long hairs have dull yellowish rusty tips. The under fur on the back sooty brown at the base, becoming faintly yellowish brown towards the end. Nose and chin whitish. (No. 1572.)

2. General color dusky. The grizzling of the dorsal surface confined mainly to the sides of the shoulders. Under fur with light brownish yellow tips. A dark rusty or chestnut suffusion round the fore legs. Nose and chin whitish. (No. 847.)

3. Similar to the last in all respects, but with the black hairs of the belly tipped mostly with dark chestnut. (No. 1571.)

4. Under parts still more chestnut, though also showing much black; above, more generally yellowish hoary. A still deeper chestnut tinge round the fore legs. (Nos. 854, 1575, 1574.)

5. Under parts pretty uniform chestnut, the bases of the hairs still dusky. The hairs around and between the bases of the fore legs brighter and deeper chestnut. (Nos. 1631, 1573.)

6. Similar to preceding, but the tail is grizzled like the back, the hairs above and below being all finely annulated with brownish yellow, white and dark brown. (Nos. 1392, 1150.)

As a generalization from these variations, it may be stated that the legs and tail are almost always black, (in 1392 the tail is grizzled like the back.) Where the belly is rusty, the region round the base of the fore legs is of a deeper chestnut. The upper parts are not pure black in any of the specimens before me; where the dorsal surface is hoary, this is most distinct, and lightest on the sides of the shoulders, as in *Spermophilus douglassii* and *beecheyi*. In all the specimens the soles are naked.

It is worthy of remark that the only specimens enumerated in which the tail is grizzled like the back, with the hairs annulated, are those from Wisconsin and Missouri.

This species, so familiarly known throughout the United States as the woodchuck, or ground hog, has been described under several names. There is now no reasonable doubt that the *Arctomys empetra*, so long kept separate from the *A. monax*, is really identical with it, as insisted on by Audubon and Bachman. According to these authors, the species ranges from Hudson's Bay to South Carolina, and westward to the Rocky Mountains. It is probable, however, that at some distance west of the Upper Missouri it is replaced by the species I have called *A. flaviventris*.

List of specimens.

Catalogue number.	Corresponding no. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Measurements.											
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore ft., length.	Hind ft., length.	Skull, length of.	Skull, width of.	Width of muzzle.	Height of ear.
1631			Middleboro', Mass.		J. W. P. Jenks.	Skin												
1571	2401		Essex co., N. Y.		Dr. S. E. Hale	do									3.46	2.33		
1572	2402		do		do	do												
1573	2403		do		do	do												
1574	2404		do		do	do									3.47	2.46	.81	
1575	2405		do		do	do												
	3064		do		do	Skull									3.53	2.46	.80	
	3065		do		do	do									3.63	2.31	.85	
847	1905	♂	do	Aug. 25, 1855	S. F. Baird	Skin ¹	1.67	3.00	3.60	14.50	4.75	6.75	2.33	3.04	3.19	2.19	.64	1.09
854	1910	♂	do	Sept. 7, 1855	do	do ²	1.50	2.10	3.50	14.00	5.08	7.08	2.42	3.14	3.27	2.00	.60	1.13
	604		Carlisle, Pa.		do	Skull											.60	
1150	2038		Racine, Wis	1855	A. C. Barry	In alcohol									3.70	2.29	.78	
1392			West Northfield, Ill.	June	R. Kennicott	Skin												
347	1261		Western Missouri	June, 1854	Dr. P. R. Hoy	Mounted									4.10	2.61	.82	
	788		Carlisle, Pa		S. F. Baird	Skull									3.78	2.40	.79	
	807		do		do	do												
	1679	○	Racine, Wis		P. R. Hoy	do									3.00	2.06		
	2008		do		do	do									3.60		.79	

¹ To end of outstretched hind legs, 20 inches.² To end of outstretched hind legs, 18 inches; longest fore claw, .60; hind claw, .42.

ARCTOMYS FLAVIVENTER, Bachman.

Yellow-Footed Marmot.

Arctomys flaviventer, AUD. & BACH. Pr. A. N. Sc. Phila. I, 1841.—IB. J. A. N. Sc. Phila. VIII, II, 1842, 309.—IB.

N. Am. Quad. III, 1853, 160; pl. cxxiv.

WAGNER, in Wiegmann's Archiv, 1843, II, 45.

SP. CH.—Size of common woodchuck. Above, yellowish brown, somewhat grizzled with gray. Under parts of body and tail, and the legs all round, inside and out, reddish chestnut.

A skin from the Black Hills, obtained by Dr. Hayden, is of very large size. The under parts, with the legs all round, are uniform chestnut brown, or dark chestnut, to the roots of the hairs. The upper parts are rusty yellowish, except in the middle portion of the lumbar region, where they are paler, and grizzled somewhat with dark brown, owing to a subterminal annulation of this color near the tips of the long hairs. The top of the head is uniform dark brown, nearly black; the top and sides of the muzzle are reddish; the under part of the chin whitish. The tail is colored much like the belly; the hairs becoming dark brownish towards the roots. Length of skin, stretched, 22 inches; tail vertebræ, 8; with the hairs, 10.

The feet are wanting in part, or else so much mutilated as not to admit of a satisfactory description. The skull of this animal has fortunately been preserved in good condition, and presents some very characteristic features, as compared with that of *A. monax*. The muzzle is remarkably short and broad, owing to the extent to which the intermaxillaries enter into its upper surface. This is connected with a much greater proportional size of the upper incisors, which require more space for their accommodation. There is a more than usual depression or concavity on the frontal bone between the orbits. The upper molars again are rather smaller

than in *A. monax*. The body of the lower jaw is lower, the descending ramus projecting further backward than in *A. monax*.

This animal agrees very well with the *A. flaviventer* of Bachman, except in being chestnut colored beneath instead of yellow. This is, however, a difference of no consequence.

A very imperfect skin, collected at Fort Dalles by Dr. Suckley, is in very imperfect fur, and does not furnish the materials for a satisfactory description. It is about the size of the northern hare, (*Lepus americanus*), and is just changing its fur, the new hairs being very short. The prevailing color above of the short hairs is a very pale grizzled brownish white and black, imparting a hoary appearance. The old soft under fur, however, is dusky at the base, then light brownish yellow, then brownish chestnut. The under parts are yellowish chestnut, the base of the fur darker; the sides of the neck and shoulders, and the area round the fore legs, with the legs themselves, are similar, but more yellowish. The tail is yellowish rusty, becoming brownish towards the roots of the hairs. The end of the muzzle all round is whitish, margined all round by a broad band of rather dark brownish chestnut, interrupted under the throat. The soles of the feet are naked.

This specimen bears a close resemblance to the *Arctomys monax*, but differs in the yellowish tail and legs.

Although there are some differences in these two specimens, yet they are hardly of specific value; at any rate, for the present I shall combine them and refer both to *Arctomys flaviventer*, a species the essential character of which appears to be in having all the legs and feet reddish inside and out, in distinction to the universally black feet of *A. monax*.

No locality is given by Bachman to his animal, having found it among some skins in the rooms of the Zoological Society of London. Supposed to have come from Western Texas or California.

List of specimens.

Catalogue number.	Corresponding no. of skull.	Age and sex.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.						
								Nose to tail.	Tail to end of	Tail to end of hairs.	Hind ft., length.	Skull, length.	Skull, width.	Width of muzzle.
997 ¹	.....	♀	Fort Dalles, O. T.	May 20, 1855	Dr. Geo. Suckley.....	60	Skin	14.75	4.50	6.50	2.80	.....	.....	.....
1525 ²	1372	.....	Black Hills, Neb.	1855	Dr. F. V. Hayden.....	.....	do	22.00	8.00	10.00	.....	3.62	2.46	.94

¹ Measured before skinning.

² Much stretched.

The following species of *Arctomys* I have not had an opportunity of examining:

ARCTOMYS PRUINOSUS, Gmelin.

Hoary Marmot, Whistler.

- Arctomys pruinus*, Gmelin, Syst. Nat. I, 1788, 144.
 SHAW, Gen. Zool. II, 1801, 121.
 SABINE, Trans. Linn. Soc. XIII, 1822, 586.
 HARLAN, Fauna Americana, 1825, 169.
 RICHARDSON, Zool. Jour. III, 1828, 518.—*Id.* F. Bor. Amer. I, 1829, 150.
 FISCHER, Synopsis, 1829, 343.
 AUD. & BACH. N. Am. Quad. III, 1853, 17; pl. ciii.
 ? *Arctomys caligatus*, Eschscholtz, Zoolog. Atlas, II, 1829, 1; pl. vi.
 RICH. Zool. Blossom, 1839, 7.
 WAGNER, Suppl. Schreber, III, 1843, 260.
 ? *Arctomys okanaganus*, KING, Narrative Back's Jour. II, 1836, 257; plate ii, vol. I.
Arctomys sibilis, WOLF, Linne's Natursystem, II, 1808, 481. (Made to embrace both *A. empetra* and *pruinosa*, supposed to be the same.)
Hoary Marmot, PENNANT, Hist. Quad. II, 1781, 130.—*Id.* Arctic Zoology, I, 1784, 112.
 ? *Arctomys monax*, MIDDENDORFF, Sibirische Reise, II, II, 1853, 85.

The whistler appears to be about the size of the common woodchuck, which it resembles in a great many respects; nor, indeed, have the precise differences been fully pointed out. The animal was first described by Pennant, as the hoary marmot, in the following terms:

"Tip of the nose black; ears short and oval; cheeks whitish; crown dusky and tawny; hair on all parts rude and long; on the back, sides, and belly, cinereous at the bottom, black in the middle, and tipped with white, so as to spread a hoariness over the whole; legs black; claws dusky; tail full of hair and ferruginous. Size of the Maryland marmot." (From F. B. A.)

To this Richardson adds the testimony of some gentlemen of the fur countries, who state that it is the size of the badger, or smaller, with much the same appearance; covered with beautiful long silver gray hair, and having a long bushy tail. Another account says that the breast and shoulders to the middle of the body are of a silver gray color; the rest of the body and the brush (or tail) of a dirty yellowish or brown.

The first satisfactory account of the supposed whistler is by Dr. King, in his "Narrative of a Journey to the Shores of the Arctic Ocean, in 1833-35, under command of Captain Back," 2 vols. 12mo. Bentley, London, 1836. He describes a living specimen brought from Fort Okanagan, and, as furnishing a better means of comparison with the woodchuck, I here introduce it entire.

"*Arctomys okanaganus*, KING. Okanagan marmot, with the head somewhat oval and flattened; nose short, obtuse, and covered with very minute hairs; incisor teeth slightly curved, upper ones anteriorly of a pale yellow, lower ones whitish; whiskers few, black, and of various lengths, but none exceeding two inches; ears semi-oval, shorter than the fur on the neck, but, from the arrangement of the hair covering the cheeks, perfectly distinct, and thickly covered on both sides with short appressed hairs; extremities short and strong; fore feet shaped for grasping, having four toes well divided, and armed with strong claws, which are compressed, curved, and rather sharp-pointed, well adapted for digging; third toe is the longest, then the second, next the inner one, and lastly the outer one; in place of a thumb there appears a rounded projection of the palm, having a small but well defined claw; palm black and bare; five hind toes, of which the middle is the longest, the one on the right next, and afterwards that on the left, then the outer one, and lastly the inner one; claws resembling those of the fore feet; sole bare and black.

"Fur around the nose and margins of the mouth grey; crown inclined to black, with a few long and irregularly scattered grey hairs; tip of the nose brown; from either side of the dorsal aspect of the head a blackish band extends in an arched form down to the fore shoulders, somewhat resembling a ram with his horns laid back; and a slight bar of the same color is spread

for about an inch along the hind part of the neck ; cheeks reddish brown, of rather a darker hue just beneath the eye ; shoulders and fore part of the back covered with long coarse hair, grey at the surface and bluish grey at the roots ; fur of the hind parts shorter by at least one half ; bluish grey at the roots, light grey in the middle, tipped with pale rusty brown, and frequently pointed with glossy black ; fore legs and feet well covered with short but dense hair, black, excepting just beyond the insertion of each claw, where a very conspicuous irregular spot of grey is seen ; hind legs and feet perfectly black ; claws rather lighter ; neck, chest, and whole ventral aspect of the body sparingly covered with a short fur of a buff color, rather lighter towards the sides ; tail depressed, slightly convex on the upper surface, but quite flat beneath ; narrowest at the root, gradually but slightly widening towards the end, where it appears rounded ; color above the same as the hind parts of the back, except at the tip, where it is dull black ; beneath entirely dull black. Total length from the nose to the tip of the tail twenty-six inches, of which the head is three inches and three-quarters, and the tail eight inches ; palm, including middle fore toe and claw, two inches and a half, while the sole, similarly measured, is three inches and a quarter ; height of ears posteriorly three-quarters of an inch, and breadth between the eyes two inches.

"The Okanagan marmot therefore is separated from Pennant's hoary marmot in not having a black nose, in the fur not being universally rude and long, and in not having on the back, sides and belly any such arrangement of colors as cinereous at the root, black in the middle, and whitish at the tip. Richardson's description in the Zoological Journal, which savors of both Pennant's and McPherson's remarks, is too slight to afford anything like satisfactory comparison ; but there are sufficient discrepancies—such as the long coarse fur on the chest—twenty-seven and a half inches being given as the length of the head and body, and two and a half for that of the head,—to show that it is not synonymous with the Okanagan. Were it not for the difference in the size of the head, which is very great, the dimensions of McPherson's animal would correspond pretty accurately with those of the Okanagan marmot, for the slight variation of an inch from the tip of the nose to the end of the tail might be reconciled by supposing that the arched form of the back had been flattened by pressure. It is very far, however, from resembling the beaver in the shape of its body, as in McPherson's specimen, being, if anything, rather broader across the shoulders than about the hind parts.

"The length of the head, the grey spot on the upper part of each of the fore toes, which strongly contrast with the black fur of the rest of the foot—the singularly arched band extending from the back of the head to either shoulder, and the peculiarly short and scanty fur covering the neck and whole ventral aspect of the body—likewise the dull black of the under part of the tail distinguish the Okanagan marmot as a new species."

"Found on a small tract of country on the borders of the Rocky Mountains, between the Columbia and Fraser's rivers, supplying with food and clothing the Okanagan Indians, included between Seechwap lake to north and Spokane river to south."

From this account it will be seen that King contests stoutly the identity of his animal with the *A. pruinosus*. It is, however, without much question, the same animal as described by Eschscholtz under the name of *A. caligata*, which has priority over *A. okanaganus*.

The specimen described and figured by King remained several years alive in the menagerie of the Zoological Society of London, and after its death was carefully preserved, and served as the basis of the figure and description of Audubon and Bachman. This fact must be borne in mind in the event of there being two northern marmots. To complete Dr. King's account, I subjoin the measurements of Audubon and Bachman.

	Inches.	Lines.
Length from nose to root of tail	19	-----
Length of tail, (vertebræ)	5.	6.
Length of tail, with hairs	7.	9.
From nose to occiput	3.	4.
Ear	-----	5½.
Palm and nail	2.	9.
Tarsus	3.	8.
Nail on hind foot	-----	8.

Middendorff, in his *Sibirische Reise*, refers to a large marmot from Kamtschatka under the

name of *Arctomys monax*, and says that they agree exactly with the figure by Audubon and Bachman of *A. pruinosus*, (the same one just described.) The paws of the Asiatic specimens he states, however, to be yellowish brown, instead of black, although the intermixture of single blackish brown hairs suggests the possibility of their varying to this extent. From the analogy of *Spermophilus parryi*, it would seem highly probable that the same species might inhabit the adjacent shores of the North Pacific.

Middendorff is inclined to think that *Arctomys caligata* of Eschscholtz may be distinct from the *A. pruinosus*, as its color is much lighter, and the tail measures ten inches in length, or about half the length of the body, both according to Eschscholtz' description and a skin brought subsequently from California by Wosnes'ens'kij, a taxidermist in the employ of the Academy of Sciences of St. Petersburg, who spent several years in the Russian possessions on the Pacific.

ARCTOMYS LEWISII, Aud. & Bach.

Lewis' Marmot.

Arctomys lewisii, Aud. & Bach. N. Am. Quad. III, 1853, 32; pl. cvii.

"SP. CH.—Size of the gray rabbit; shape of head and body similar to that of *Arctomys monax*. Tail, with the hairs, about one-fifth the head and body. Nose and nails black. Upper surface and ears reddish brown, the softer dense under fur being light yellowish brown, the longer interspersed hairs blackish brown at the tips. On the haunches the hairs are interspersed with black and yellowish brown; feet and belly light salmon red. Tail from the root, for half its length, reddish brown; the other half to the tip, soiled white. Above the nose, edges of ears, and along the cheeks, pale reddish buff. There is a white band across the toes, and another irregular one behind them; there is an irregularly defined dark brown line round the back of head and lower part of the chin, marking the separation of the head from the throat and neck."

	Inches.
Length from nose to root of tail	16
Tail, (vertebræ)	2
Tail, with hairs	3
Nose to ear	3
Nose to eye	1
Heel to middle claw	2½

The specimen described as above was found by the authors in the museum of the Zoological Society, where it is labelled "*Arctomys brachyura?* No. 461." It was received from some of western British fur posts, and supposed to have been collected somewhere in the vicinity of the Columbia river.

From the description, as well as the figure, I should be inclined to consider this animal rather as a prairie dog (*Cynomys*) than as a true marmot (*Arctomys*). The tail and feet are much shorter in their proportions than in our other *Arctomys*, but agree very closely with the other genus. Thus, in a fresh specimen of the Missouri prairie dog, (No. 1803,) the head and body measure 13 inches; the head alone, 3½; nose to ear, 2½; the hind foot, 2.38. The tail is nearly twice as long as in *A. lewisii*. A very little stretching of the skin, which it could scarcely fail to receive after stuffing, and especially if prepared as hunters' skins usually are, would bring these measurements to 16 inches for the length to root of tail, and one-eighth of an inch added to the hind feet would make up three inches. Now, in a fresh specimen of *A.*

monax, No. 854,) the head and body measure 14 inches, and the hind foot 3.14. The tail, with the hairs, measures 7 inches.

The most important point, however, is in the character of the thumb. *Cynomys*, as already explained, differs from *Arctomys* in having the thumb moderately developed, and armed with a distinct *claw*, nearly as long as the fifth, the soles hairy; while in *Arctomys*, the thumb is more rudimentary and armed only with a broad flat *nail*, very different in character from the prominent claw of the other. The soles also are perfectly smooth. Now, Audubon & Bachman expressly mention that the "thumbs, instead of being remarkably short and equipped with blunt nails, have long nails nearly the length of those on the other toes." Nothing is said of the character of the soles.

The next question that remains to be discussed is the relationship of the species to the *burrowing squirrel of the Columbia*, of Lewis and Clark.—See article under *Cynomys gunnisonii*, page 336.

It is quite possible, judging from the descriptions, that the *Arctomys lewisii* may be the same animal as Lewis and Clark described from a fresh specimen $12\frac{1}{2}$ inches long, which might easily be stretched to 16. The dimensions of the tail are almost precisely the same. The flat distichous tail of a living animal might easily become rounded in a skin, especially if the caudal vertebræ were removed. The discrepancies in the descriptions of the feet are more apparent than real, especially if, in speaking of the "two inner thumbs of the fore feet," they meant only one thumb to each foot, as is most probable. Nor do our authors make any special reference to the claws; they merely say that the *thumbs* are remarkably short, and equipped with blunt nails, the remaining toes being long. Now, in *Arctomys*, the thumbs and their nails or claws would probably not be mentioned at all by unscientific authors, as they are so minute and inconspicuous as scarcely to attract attention. In color of body and tail the descriptions agree almost precisely.

The fact that Lewis and Clark refer to their animal as a squirrel does not militate against it being a *Cynomys*, as they call the common prairie dog, the barking squirrel of the Missouri.

For the above reasons I am inclined to consider the *Arctomys lewisii* rather as a *Cynomys*, and quite possibly the same with the burrowing squirrel of Lewis and Clark, called *Arctomys columbianus*, by Ord, and *Anisonyx brachyura*, by Rafinesque.

SUB-FAMILY MYOXINAE.

Molars $\frac{4-4}{4-4}$, rooted unequal. Post-orbital process wanting. No coecum. Tail variable; hairy. Ante-orbital foramen situated in the anterior base of the zygomatic arch, small, rounded.

I have introduced a short notice of the *Myoxinae* for the purpose of completing the history of the *Sciuridae*, although no species are known as inhabiting North America. They have quite a general resemblance to the squirrels, but differ in many important points, in fact some authors place them among the *Muridae*.

The incisors are laterally compressed; the molars unequal in size, with the crowns not simply tubercular but complicated; the series on each side are widely separated and parallel.

There is no post-orbital process in the present sub-family, so conspicuous in the *Sciurinae*. The zygomatic process of the maxillary consists of a broad thin plate extending from the plane of the palate to the upper surface of the skull; this has a moderately large ante-orbital foramen. Incisive foramina partly in the maxillary, partly in the intermaxillary; palatine process of the maxillary terminating opposite the penultimate molar, followed by a narrow palatine process of the palatine bone. The interparietal bone is much extended transversely, so as to reach the temporal bones on either side, instead, as in the squirrels, of not extending beyond the parietals.

Lower jaw with the branches more diverging than in the squirrels; the descending ramus forming a quadrate process, which is sometimes perforated. The lower posterior angle of this process is incurved, and either angular or rounded. The upper posterior angle is acute and twisted outwards.

The anterior small molar of the squirrels is wanting; the crowns are traversed by transverse ridges; the teeth varying with the genera, from a quite simple structure to a very complicated one.

The intestinal canal differs from that of all other rodents in having no coecum. The gall bladder is present.

The form of the skull in some respects approximates to that of the *Dipodinae*.

The genera of this sub-family are *Graphiurus*, *Eliomys*, *Glis*, and *Muscardinus*—all belonging to Europe, Central Asia, and Africa.

A species of *Myoxus* was described many years ago by Reich,¹ under the name of *M. virginicus*, and said to have been brought alive from somewhere near the base of the Blue Mountains of Virginia. The animal was about as large as the house mouse; the body measuring 3 inches, the tail $1\frac{1}{2}$. The tail was hairy and tufted at the tip; the body reddish brown, paler beneath. The figure appears to represent a true *Myoxus*, and certainly differs from any animal now known to inhabit the United States. It is, however, not impossible that such a species may exist within our limits, and have hitherto escaped detection, although this is not very probable.

¹ Reich, Beschreibung einer neuer Art von Schläfer; Mag. Gesellschaft Naturf. Freunde, zu Berlin, 1810, 243; tab. viii.

SUB-FAMILY CASTORINAE.

Molars $\frac{5-6}{4-4}$ or $\frac{4-4}{4-4}$, rootless. No post-orbital process. Ante-orbital foramen small, rounded, very far forward, or in the base of the zygoma; fore feet with five distinct toes and claws.

The two genera, *Castor* and *Aplodontia*, have long proved stumbling blocks in the way of a systematic arrangement of the rodents. Partly in consequence of the difficulty in getting specimens, and partly in consequence of the actual combination of characters of other forms, these genera have been placed, by each different author, in some new relationship, although there has of late been a decided tendency to place them near or among the *Sciuridae*. In this view I am disposed to concur, although there still remains the question, whether the two are not typical of as many different sub-families, themselves forming a family of full rank? Waiving this question until fuller series of entire specimens may serve to decide, I shall, for the present, unite them as above.

The two genera, then, *Castor* and *Aplodontia*, are confined to the northern hemisphere, the latter, indeed, restricted to a very narrow region on the west coast. The two are readily distinguished by the flat scaly tail, webbed feet, and the complicated molars $\frac{4-4}{4-4}$ of *Castor*, and the very short and hairy tail, unwebbed feet, and simple molars $\frac{5-6}{4-4}$ of *Aplodontia*.

APLODONTIA, Rich.

Aplodontia, RICHARDSON, Zool. Jour. IV, Jan. 1829, 334.—IB. F. Bor. Am. I, 1829, 210.

AUD. and BACH. N. Am. Quad. III, 1853, 98.

Haplodon, WAGLER, Syst. Amphib. 1831, 23.

WAGNER, Suppl. Schreb. II, 1843, 395.

Aplodontia, RICH. Rep. British Assoc. for 1836, V, 1837, 187.

Haplodon or *Haplodon*, BRANDT, Beit. Kennt. Säugt. Russl. 1855, 150.

Anisonyx, RAPINESQUE, Am. Monthl. Mag. II, 1817, 45. (In part.)

Ears moderate, distinctly visible; muffle as in *Sciuridae*. Fore claws much larger than hinder ones; the short thumb with a well developed claw; soles and heels naked. Tail very short, almost rudimentary. Skull very much depressed, triangular. Molars $\frac{5-6}{4-4}$, prismatic; the anterior very small.

The systematic position of this genus has long been a matter of uncertainty, owing to the fact that the single species has only been known from the specimen described first by Richardson, and subsequently by Audubon and Bachman. In many respects, however, it bears a very close resemblance to the spermophiles, particularly to *Cynomys ludovicianus*; having a similar muffle, fore feet with five claws, rather larger ears, still shorter tail, &c. The outline and some other characteristics of the skull continue the analogy, which fails, however, in the rootless molars, the absence of post-orbital processes, and the presence of a rounded foramen in the base of the zygoma. In the rootless molars and absence of post-orbital process, it resembles *Castor*. In the absence of information respecting the skeleton, and internal anatomy generally, it is impossible to say where it should be placed; in a linear series, however, it would seem to connect *Castor* with the squirrels, through the spermophiles. Of any affinities with *Myoxinae*

I am unable to speak further than that both are destitute of the post-orbital process. The distinct rounded ante-orbital foramen, in the base of the zygoma, resembles somewhat that of *Tamias*.

Skull.—The skull of *Aplodontia*, with the exception of the rootless molars and the lack of a post-orbital process, offers many points of close relationship to that of *Sciuridae* generally. It is, however, most remarkably depressed or flattened, the planes of the upper and under surfaces almost parallel. Viewed from above, its shape, exclusive of the muzzle, is that of an equilateral triangle; the occiput, almost the widest part of the skull, nearly equals the greatest distance between the zygomata; its plane is vertical and perpendicular to that of the palate. The occipital crest is well developed, with a decided fossa anterior to it on each side of the top of the skull; its two halves curve slightly forward from the exterior to their place of meeting on the sagittal suture. The upper part of the cranium is much rounded or arched. There is, however, a decided spherically concave depression between the orbits, just anterior to the region of greatest contraction. This contraction is very great, situated posterior to the centre of the skull, which at this point is narrower than the nasal bones, and only about half the distance between the outer borders of the alveoli of the second anterior molars, or equal to the length of the crowns of the second and third molars. The bony orbits are very large; viewed from above, they are somewhat right-angled triangled, the shortest side the antero-interior, about two-thirds the length of the postero-interior, which is nearly straight. The hypotenuse is considerably curved, and formed by the inner border of the malar bone. The muzzle is large and much rounded; indeed, its vertical section across the middle would be nearly circular.

Owing to the extreme age of the specimens it is impossible to trace out the course of the sutures, and consequently to indicate the connexions of the malar. The lachrymal bone may be identified, however, in a tubercle at the anterior angular extremity of the orbit, and immediately within and behind this is a distinct notch, with a small process, which represents the ante-orbital; the edge of the frontal then curves rapidly inwards, as described, without any post-orbital process whatever. The cavity of the cranium is consequently very small, compared with the true squirrel.

The posterior root of the malar bone is thin, and passes out from the temporal in a horizontal plane, where it is twisted more vertically and passes forward; its lower edge, horizontal or slightly concave, extends beyond the anterior molar, and then descending very little reaches the plane of the palate. The palate itself is nearly horizontal from the incisors; although anterior to the molars it slopes off on each side of the middle region. The ante-orbital foramen is not large; it is oval, the longer axis directed obliquely upwards, outwards and forwards; the two branches of the zygoma forming its outer walls are nearly equal. The incisive foramina are large, situated just back of the incisors, and are one-third as long as the distance from incisors to molars. The largest palato-maxillary foramina are between the centres of the fourth molars; the palate between the molars is perfectly plane and extends behind the last molar, by its own length terminating in a concave edge behind. The glenoid cavity is remarkably long, broad and shallow.

The auditory bullae are quite small, but open rapidly into very wide auditive tubes, much larger, with thinner walls, than in the beaver; these extend horizontally beyond the posterior angle of the zygoma.

The inner lines of molar alveoli are about parallel; the outer are slightly divergent anteriorly, owing to the increase in size of the molars from behind—from the fifth to the second in

the upper jaw, from fourth to first in the lower. The first molar above is very small, and situated against the antero-internal corner of the second; it is oval and simple. All the molars are prismatic and rootless. The general shape of their section in the upper jaw is circular, the inner side quite so; the outer, however, with a prominent salient angle, on either side of which is a slight concavity. The second upper molar is larger, and has a concavity on the antero-internal corner. The lower molars are rather longer and narrower, somewhat like the upper, except that the salient angle is on the inner side; and there is a decided groove on the outside, anterior to the middle of the tooth. The molars of both jaws are situated much further back than usual, the middle of the skull being opposite the junction of the second and third; the line of the molars is a little more than one-fourth the length of the skull. The incisors of both jaws are much rounded anteriorly: the section of the upper nearly circular, of the lower sub-triangular.

The lower jaw is very remarkable in its shape. The inner edges of the molars of opposite sides are perfectly parallel. The descending ramus is twisted so as to be perfectly horizontal behind, its postero-inferior edge being a straight line, almost exactly perpendicular to the vertical plane of the axis of the skull. The inferior angle of the descending ramus, now become interior, is extended inwards until those of opposite sides are separated by the interval between the molars. The condyles have their long axis transverse, and are convex externally; the condyloid process is low, its upper edge straight and nearly horizontal, the coronoid process rising anterior to it, very broad, high and falciform. The junction of the first and second molars is about midway between the end of the incisors and the back part of the condyles.

From the above description of the skull of *Aplodontia*, it will be seen that there is a remarkable predominance of horizontal planes and straight lines perpendicular to the three co-ordinate planes. Thus the plane of the occiput is vertical and perpendicular to that of the base of the skull, which itself, as nearly as may be, is horizontal. The general outline of the top of the head is parallel with that of the bottom; the lower edge of the occiput is horizontal and perpendicular to the horizontal axis of the skull. The lower edge of the zygoma is nearly rectilinear and parallel with the plane of the palate. In the lower jaw a vertical plane would be tangent to the condyles and the nearly horizontal posterior edge of the inferior ramus. The planes, of the broad coronoid processes are vertical, though inclined to each other.

From the preceding description, therefore, of *Aplodontia*, it will, I think, be clearly evident that its affinities are decidedly with the *Sciuridae*.

The genus *Aplodontia* was first established by Richardson as properly expressing the characters of the animal. Somewhat faulty in its etymological construction, the name has been variously modified by purists; but as one well established by use, I have considered it best to adhere to the one originally given by Richardson.

The genus *Anisonyx* was established by Rafinesque to embrace the general characters of the "burrowing squirrel" of Lewis and Clark, as given by them, but entirely misapprehended by him. As the diagnosis does not really apply in many important points, it will be necessary to reject the name, especially as it comes much nearer to *Cynomys*, a genus of the same author, and well characterized by him about the same time.

APLODONTIA LEPORINA, Rich.

Sewellel; Showt'l.

Apلودontia leporina, RICHARDSON, Zool. Jour. IV, Jan. 1829, 335.—Ib. Fauna Bor. Am. I, 1829, 211; plate xviii, C, fig. 7—14.

PEALE, Mam. & Birds Ex. Ex. 1848, 56. Wood cut fig. of skull.

AUD. & BACH. N. Am. Quad. III. 1853, 99; plate cxxiii.

Haplodon leporinus, WAGLER, Syst. Amph. 1830.

WAGNER, Suppl. Schreb. III, 1843, 396.

Anisonyx rufa, RAFINESQUE, Am. Month. Mag. II, 1817, 45.

Arctomys rufa, HARLAN, F. Am. 1825, 308.

Sewellel, LEWIS & CLARKE, Travels, II, 1815, 176.

SP. CH.—Size of muskrat, with much of its general appearance; reddish brown all over, with a more plumbeous cast below.

The eyes of this species are very small, and situated about midway between the nose and the ear. The whiskers are longer than the head, stiff, of a plumbeous brown and dark gray, intermixed. The ears are short and rounded, covered on both sides with short hair. The tail is shorter than the hind foot; it is much depressed—this character very distinct in the vertebræ. The third finger is longest; the fourth a little shorter, next the third. The claw of the fifth reaches a little beyond the base of that of the third; the claw of the first does not extend to the base of the other fingers. On the hind foot the three central toes and claws are nearly equal. The fifth claw reaches not quite to the middle of the fourth; the first a little beyond the base of the second. The palms and soles are naked; the former with two large basal tubercles, as in *Geomys*.

The fur consists of a soft dense woolly fur, with longer and bristly hairs interspersed. This fur is of a grayish plumbeous at the base; at the ends it is of a dull reddish brown. On the under parts the plumbeous predominates. The interspersed hairs are black. Some specimens are of a darker cast above.

As the skins before me are somewhat distorted, I add the dimensions of a mounted specimen brought home by the United States Exploring Expedition, under Captain Wilkes.

General dimensions.	Inches.	Lines.
Nose to occiput.....	3	7
eye.....	1	5
ear.....	2	5
root of tail along the curve.....	15	6
Tail from root to end of vertebræ.....		10
hairs.....	1	6
Ear, height, posteriorly.....		5
width.....		6
Arm, fore foot to end of claws.....	1	7½
longest claw.....		7
Leg, hind foot from heel to end of claws.....	2	1
longest claw.....		4½

This animal, though not rare in the vicinity of Puget's Sound, is yet very little known to

naturalists, although the materials at our command are richer now than a few years ago, when Audubon and Bachman were unable to find a specimen in any museum of the United States. Several specimens collected by Dr. Suckley and Lieut. Trowbridge do not admit of any positive addition to the account given above, based on Mr. Peale's specimen. I have heard of an *Aplodontia* from the mountains of California, probably the same species, but have not seen a specimen.

The name of Sewellel for this animal is not at present used on the northwest coast, according to Dr. Suckley; it is now called Showt'l, a word quite similar in sound to the old one. Lewis and Clarke, in describing it under this name, mention that the tail is always removed by the Indians in dressing, misled by the exceedingly rudimentary condition of this member.

It is perhaps a question whether the true name of this species be not *Aplodontia rufa*, after Rafinesque. Although his description is incorrect, it was based on the Sewellel of Lewis and Clarke, which is unquestionably the *Aplodontia leporina* of Richardson. As, however, Rafinesque asserts positively that certain characters apply to his *Anisonyx rufa*, which really do not exist in *Aplodontia leporina*, we may be warranted in avoiding the use of his specific name for Richardson's animal. It may, perhaps, be well to repeat that Rafinesque bases his description entirely upon a partly erroneous interpretation of the article of Lewis and Clarke.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								From tip of nose to tail.	Length of hind foot.	Length of skull.	Width of skull.	
.....	.....	.....	Puget's Sound. ....	.....	U. S. Ex. Exped. ....	.....	Mounted ....	.....	.....	2.79	2.18	.....
1966	2621	♂	Steilacoom, W. T. .	.....	Dr. Geo. Suckley	93	Skin	15	2.60	.....	.....	.....
1965	2620	♂	do. ....	.....	.....do.	92	..do.	13	.....	.....	.....	.....
278	.....	.....	.....do.	1854.	Gov. I. I. Stevens.	11	..do. ....	.....	.....	.....	.....	Dr. Geo. Suckley..
966	.....	.....	Astoria, O. T.	June 15, 1855	Lt. W. P. Trowbridge..	.....	..do.	13	1.80	.....	.....	Jas. Wayne.

CASTOR, Linnaeus.

Castor, "LINNAEUS, Systema Naturæ, 1735."

AUD. & BACH, N. Am. Quad. I, 1849, 347.

A double claw on the second hind toe. Hind feet webbed. Tail broad, flat, and scaly. Molars $\frac{1}{2}$ — $\frac{1}{4}$, complicated or folded, with one groove on the inner side of each upper molar, and three on the outer, and vice versa below, (the anterior molar sometimes with more.)

As we have but one species of North American beaver, I shall not stop here to go into more detail concerning the characters of the genus, but refer for these to the succeeding pages, where they are given in combination with those that are perhaps more specific.

The systematic position of the genus *Castor* has long been a matter of considerable uncertainty. By some authors it has been placed in a distinct family, composed of *Castor* and *Myopotamus*. The last mentioned genus, in everything but external form is, however, most closely allied to the *Hystriinae*, while the beaver in many points of structure is closely related to the *Sciuridae*, especially to the spermophiles; and it may, therefore, without undue violence be placed as a sub-family of the *Sciuridae*. The general resemblance in shape between the skull of the beaver and that of some of the spermophiles, as *S. ludovicianus*, is indeed quite striking; the form and relations of the malar bones and the ante-orbital foramen are much the same in both.

CASTOR CANADENSIS, Kuhl.

American Beaver.

Castor canadensis, KUHLE, Beiträge zur Zoologie, 1820, 64.

FISCHER, Synopsis, 1829, 288.

"*Castor americanus*, F. CUVIER, Histoire des Mammif. 1821."

BRANDT, Beiträge Kennt. Säugt. Russlands, 1855, 64; pl. i, ii, iii (figures of tail and skull).

Castor fiber, SAY, Long's Exped. R. Mts. I, 1823, 464.

HARLAN, F. Am. 1825, 122.

GODMAN, Am. N. H. II, 21.

DOUGHTY, Cab. N. H. III, 1833; pl. i.

WATERHOUSE, Charlesw. Mag. N. H. III, 1839, 598; (figure of skull.)

DEKAY, N. Hist. N. Y. I, 1842, 72; pl. xx, f. 1; pl. viii, f. a. b.

(*Americanus*), RICHARDSON, F. B. Amer. I, 1829, 105.

WAGNER, Suppl. Schreber, IV, 1844, 7.

AUD. & BACH. N. Am. Quad. I, 1849, 347; pl. xlv.

Castor beaver, PENNANT, Hist. Quad. 1781, No. 251.—IB. Arctic Zool. I, 1784, 98; (Leverian Museum).

Le castor du Canada, GEOFFR. & F. CUVIER, Hist. Nat. des Mammif. III, 1819, plate.

The specimen from which the following account of the external form has been taken is quite young, measuring one foot in length to end of tail, and was preserved entire in alcohol.

The general form of the beaver is that of a depressed ellipsoid, tapering almost equally to the head and the scaly portion of the tail.

The head is large and broad; the muffle is naked; the hinder border, or line of separation from the hairs of the forehead, is slightly concave anteriorly, and falls considerably behind the nostrils, (in the small specimen described five lines from the tip,) and the space all round the nostrils is naked. The nostrils are lateral and widely open. The antero-inferior border of

the muffle is separated, by a considerable interval, from the edge of the upper lip; this interval entirely covered with short hairs. The upper lip is acutely emarginated, though scarcely bifid; there is no naked groove running up to the muffle. There are no cheek pouches. The hairs of the lips extend a short distance on their inner surface, but do not pass into the cavity of the mouth, as in some rodents. The tongue is very large and fleshy. The eyes are excessively small, the iris not two lines in diameter; their centres about midway between the end of the snout and the auditory aperture. The ears are moderately developed, thick, and nearly orbicular, densely covered with hair on both surfaces, the hairs extending even into the meatus. The bristles are in five horizontal series, about five in each series; the upper row, however, with only one or two.

The limbs are large and stout; the under surfaces of all the feet entirely naked; the upper surfaces coated with short stiff silky hairs; the fore claws are about as large as the hinder ones. The hand has five very distinct fingers, each with well developed claws; the third finger is longest, the fourth a little shorter; then the second and the fifth; the claw of the first reaches as far as the cleft between the third and fourth. There are only two tubercles on the palm, both large, and placed side by side; the exterior twice as large as the interior, and extending further back. The hind feet are very large and turtle-like; their plane oblique to the body. All the toes connected by a thickened web, extending between their very tips; this web is naked on the upper side between the toes, and when fully extended the foot appears nearly twice as broad as long. There are but faint indications of broad flattened tubercles at the base of the toe. The claws are hollowed out beneath, with the sharp edges a little inflexed; they are curved and rounded. There is a kind of second claw under the claw of the second toe, of a rather hard horn-like substance, compressed and sharp-edged above where it fits into the concavity beneath of the true claw; in shape, it is not unlike a compressed grain of wheat. The sole is naked to the posterior part of the heel, and, with the palm and digits generally, is slightly fringed with short stiff hairs. The tibia is very slightly free, being closely united by muscle to the femur.

The tail is really as long as the body without the head, though it is so thick for more than one-third from the base that its commencement can scarcely be made out; for this distance it is conical and densely coated with hair, when it suddenly becomes very flat and much depressed; the sides somewhat parallel to near the end, where they round off, the shape strongly resembling that of a mammal's tongue. This portion is entirely covered with transversely elongated subhexagonal scales, of which about 110 to 120 series may be counted on the upper side, and some twenty transversely over the middle of the tail; the arrangement is in quincunx, with tolerable regularity on both sides, and there are short downy hairs projecting between all the scales, obscuring but not concealing them.

The principal points in the external form of the beaver, and which may be considered as of generic signification, are the depressed, flattened and very broad tail covered with scales; all the feet naked beneath, with five toes each, with a distinct claw; the hind feet completely webbed; upper lips but slightly cleft, hairy with no groove; muffle naked; eyes very small; bristles in five series.

The color of the beaver varies considerably in different specimens, even of the same locality, the usual color being a reddish brown, sometimes quite dark, and again of rather a light yellowish tint of the same; I have heard of skins nearly black, and albinos are by no means

rare. The lightest specimens I have seen are 1548 from the upper Missouri, and 1337 from the Colorado river of California.

Measurements of No. 898.

	Inches.	Lines.
Nose to occiput	3	-----
eye.....	1	3
ear.....	2	3
root of tail.	8	6
scaly portion.....	10	6
end of outstretched hind legs.....	12	-----
Tail, from root to end of vertebræ.....	4	4
from scaly portion to end of vertebræ.....	3	-----
width.....	1	2
Ears, height, posteriorly.....		5½
above notch		7
internally above skull.....		4½
Arm, fore foot to end of claws.....	1	3½
longest claw.....		3½
Leg, from knee joint to end of claws.....	4	6
hind foot, from heel to end of claws.....	2	8
longest claw.....		4

In young specimens the tibia and fibula are distinct but ankylose with age. The line of junction is, however, quite distinct, even in old specimens.

Skull.—The skull of the beaver is very massive and heavy, and has many peculiarities not shared by other genera of rodents. The nasal bones are broad and short, widest anteriorly and narrowing posteriorly; the external border a convex curve. The line drawn across the posterior extremity of these bones falls either on the small tuberosity of the ante-orbital process of the frontal or a little behind it, in no case reaching as far as the middle of the orbit, as in the European beaver. The nasal processes of the intermaxillary do not extend quite so far back, but attain a point between the tuberosities referred to. There is no post-orbital process to the frontal bone, although a tubercle not quite so prominent as that in the anterior process may, perhaps, be considered to represent one. The malar bone is much as in the *Sciurinae*, except that it is proportionally much higher in its middle portion. The anterior border of the zygomatic arch is not formed by the malar bone, but by the maxillary which shows a thin edge applied against the malar for half its extent exteriorly. The malar extends up to the anterior end of the orbit, which is there constituted by it, and is separated from contact with the frontal by the small subquadrate external face of the lachrymal. The malar sends up a broad flattened angular process which constitutes the postero-inferior wall of the orbit. Posteriorly it passes along the under surface of the malar process of the temporal, and passes a little behind this process. It also forms the exterior wall of the glenoid cavity.

The incisive foramina are long and narrow, situated about midway between the incisors and molars, occupying rather less than one-third of this interval. They are situated almost entirely in the intermaxillary bones; the posterior ends, with a thin vertical plate, (extending forward for half their length,) belonging to the maxillary. The palatine bones extend forward in an

acute angle between the second molars, (first true molars.) The palatal foramina are situated on either side the point of the palatines, their posterior extremity reaching to between the second and third molars. These foramina are situated each in a narrow groove, separated by a ridge which traverses the entire bony palate from the incisive foramen to its posterior acute azygos process. The palate between the molars is considerably cribriform.

The ante-orbital foramen is not visible at all from the side. It is hidden from view by a broad plate projecting forward from the anterior edge of the maxillary; it is quite small and vertically elongated, and gives passage to no muscle. It is entirely separated from the zygomatic arch, being far forward of it.

The lines of the upper molars are decidedly convergent, and are nearly tangent with the side of the incisors. The palate is much hollowed out between the incisors and the molars, in this respect differing more from the *Sciurinae* than in other points. The inner side of the upper molars exhibits one groove, the outer three; this being reversed in the lower jaw, except in the anterior molar, which shows four grooves on the inner side. The anterior molars, in both jaws, are largest, the rest diminishing backwards very gradually; the anterior lower molar is, however, longer, proportionally, than the corresponding upper one, and the lower line of molars exceeds considerably the upper.

The following table will illustrate the absolute dimensions of the skull of the American beaver:

Measurements of skulls.

Current numbers.	Locality.	Age and sex.	Length.	Width.	Width of muzzle at base.	Length of nasal.	Collected by—
2146	Cheyenne river, Nebraska ----	♀	5.80	4.16	1.54	2.00	Dr. Hayden -----
2377	Upper Missouri -----		5.53	4.04	1.40	2.00	-----do-----
2378	-----do-----		5.38	3.90	1.36	1.84	-----do-----
1003	Rio Grande, Texas -----	♂	5.38	3.86	1.30	1.87	J. H. Clark -----
1414	Matamoras -----		5.32	3.96	1.36	1.80	Lieut. Couch -----
1416	-----do-----		5.30	3.82		1.70	-----do-----
2031	Washington Territory -----		5.23	3.37	1.12	1.81	Dr. Cooper -----
823	Upper Missouri -----		5.17	3.70	1.12	1.70	T. Culbertson -----
2376	-----do-----		4.82	3.48	1.10	1.70	Dr. Hayden -----
2380	-----do-----		4.73	3.50		1.60	-----do-----
2144	-----do-----	♂	4.67	3.40	1.10	1.62	-----do-----
2270	Lake Superior -----		4.60			1.58	Dr. Newberry -----
2145	Upper Missouri -----		4.59	3.25		1.50	Dr. Hayden -----
2143	-----do-----		4.50	3.29	1.10	1.50	-----do-----

The European and American beaver, though apparently very similar, may (as stated by Cuvier in *Ossements Fossiles*, VIII, 112, and by Owen, *British Fossil Mammals and Birds*, 196; *Catal. Osteol. Series R. Coll. Surgeons*, 1853, II, No. 2162) be always distinguished by the position of the posterior extremities of the nasal bone. In the Old World species the transverse line touching the point of the nasal bones intersects the orbits behind their middle part, while in

the American a similar line only intersects the ante-orbital tubercular process of the frontal, sometimes, indeed, scarcely falling across the orbits at all. In a young specimen from New York, S. M. 1072, however, this line falls but little anterior to the middle of the orbit; five adult skulls, nevertheless, agree in the more anterior position of the line. In the absence of a skull of the European beaver, I am unable to verify these characteristics, as indicated by Professor Owen, but they are well shown in his figure, from which, also, it will appear that the distance from the anterior end of the intermaxillary bones to the end of the nasal is the same with that from the same point to the anterior molar, or that the two points are situated the one above the other, while in the American beaver the latter line is considerably the longer. The sides of the nasal bones are much more convex in the American. The cranium of the European species seems also longer and more compressed. The cavity in the under surface of the basilar process of the occipital is much larger and broader than in the American. The palatal foramina appear to be further back in the European beaver, where they reach as far as the middle of the third molar, while in the American they only get as far as the interval between the second and third.

The following comparative table of measurements of the skulls of the European and American beavers may serve to illustrate more fully the above differences. The first column contains the measurements of a recent beaver from France, as given by Cuvier, (*Ossements Fossiles*, VIII, 96;) the other, those of skull No. 823, from the upper Missouri.

The measurements of both are given in millimetres.

Comparative measurements of skulls of European and American beavers.

	European.	American.
From summit of occipital crest to anterior extremity of intermaxillary.....	0.146	0.130
From same point to anterior extremity of nasal.....	0.142	0.129
Greatest width between zygomatic arches.....	0.102	0.094½
Most contracted portion of skull between orbits.....	0.025	0.023
Width of cranium between zygomatic processes of temporal and auditive tube.....	0.046	0.047
Width of the nose near its extremity.....	0.028	0.029
Distance between external border of the auditive tubes.....	0.072	0.075
Height from alveolar border to the summit of the narrowest part of cranium.....	0.050	0.047
Height from middle part of the incisive foramina to middle portion of the nasal bone.....	0.035	0.035
Height of occipital foramen.....	0.018	0.016½
Greatest width of occipital foramen.....	0.017	0.018½
Distance from occipital foramen to posterior border of palatine arch, (concave edge).....	0.041	0.039
Distance from posterior border of palatine arch to incisive foramen.....	0.048	0.045½
Distance from anterior extremity of the incisive foramen to the anterior border of alveolus of incisors.	0.025	0.027
Length of alveolar border of molars.....	0.030	0.029
Distance between external borders of last molars.....	0.038	0.035½
Distance between external borders of first molars.....	0.025	0.028
Distance from posterior angle of lower jaw to anterior upper border of the alveoli of incisors.....	0.109	0.105

In a very elaborate series of papers published recently by Brandt—in volume VII of the *Mémoires Mathématiques, Physiques, et Naturelles* of the Academy of Sciences of St. Petersburg, and also issued in a separate work under the title of *Beiträge zur nähern Kenntniss der Säugthiere Russlands*, (St. Petersburg, 1855, 4to.)—the author devotes many pages to the

beaver, and in them discusses at great length the question of the relationships of these animals in the two worlds. He sums up the evidence on the subject as follows :

1st. The external distinctive marks given by Kuhl, Oken, and others, have no real value in showing a difference of species.

2d. The size of the American beaver is not essentially, if at all, greater than that of the European.

3d. No distinctive characters between the two have yet been detected in the formation and structure of the head, ear, feet, and tail.

4th. A comparison of eight European with five American beaver skulls shows very decided distinctive characters between the two.

5th. Many of these differences in the skull involve variations in external form.

6th. The established difference between the two in the castoreum bag and its secretion furnish strong grounds of specific distinction.

In reference to the comparative sizes of the beavers of the two worlds, it is quite evident that Brandt has not known the largest of our beavers in the skulls before him. Thus, the largest European skull he had observed measured 5.60 inches by 3.91, reducing his scale of French inches to English ; the largest American measured 5.24 inches by 3.60. From the accompanying table of measurements of skulls of American beavers in the Smithsonian collection, it will be seen that the largest measures 5.80 by 4.16 inches, (dimensions taken with callipers,) and that nearly half of them exceed the size given by Brandt. The largest measurements given of the Polish beaver amount to about 34 inches for the head and body, and 11 inches for the tail. These, if French, would be 36.23 inches for the one, and 11.72 for the other. The largest skin measured of the Smithsonian collection gives to root of tail 35 inches, length of tail 11 inches, width of tail $5\frac{1}{2}$ inches, length of hind foot 6 inches. I have, however, seen others very appreciably larger ; and this specimen was not stuffed out at all, but the skin was perfectly flat.

It will thus be seen that the largest beaver skull recorded thus far is an American one, thus inclining the balance of size in favor of our species. The largest weight I have known of an American beaver was of 56 and 60 pounds, as given by Dr. Hayden ; he is, however, confident that he has seen them still larger. The heaviest Old World beaver on record is one of 50 pounds, mentioned by Pallas. Brandt suggests that this is the smaller Russian pound ; its ratio to the English pound I am unable to state.

The differences of the skull are, to a certain extent, such as have already been referred to, although our author does not find the difference in the upper outline of the head, the malar bone, and the portion enclosing the brain, mentioned by Cuvier. The most constant and quite appreciable difference was in the character of the nasal bones, which, in all European specimens, measure considerably more than one-third of the distance from the incisors to the *crista occipitalis*, while in the American they are little, if at all, over one-third this length. The backward projection of the nasals is therefore much greater in the European animal. Many other less appreciable differences are indicated in Dr. Brandt's elaborate article.

An appreciable difference in the castoreum bag of the two animals is mentioned by Brandt. In the American beaver, this is more elongated and less thick skinned than in the European. The castoreum itself also is not only less in volume, but when long exposed to the air, or kept a good while, assumes a more or less lustrous amber-like appearance, not wax-like and lustreless as in the European. In this secretion of the European animal there is much the largest proportion of "etherial oil, castorine, and castoreum-resinoid."

The American beaver being satisfactorily shown to be distinct from the old world animal, of course, cannot continue to be called *Castor fiber*. For the proper specific appellation we have two names, *canadensis* of Kuhl, and *americanus* of F. Cuvier. The date of the former is 1820; the precise place where the latter name is introduced I have not been able to ascertain. The *Hist. des Mammifères du Mus.* is usually given as the reference, but here the animal is merely called *Le Castor du Canada* in the 6th fasciculus (1819.) According to Brandt, F. Cuvier first broached his views of the difference of the species, in the 51st fasciculus of this work, 1825, and there probably gave the name; but this I am not able to verify at present, not having part 51 at hand. At any rate the point of priority seems to be settled clearly in favor of Kuhl's name.

The American beaver has a very wide distribution throughout North America, being found from the Polar seas to the Rio Grande, and the Gila on the south, or to, at least, latitude 26° on the east side of the continent, (the mouth of the Rio Grande.) Formerly it extended from the Atlantic to the Pacific, but it is at present very rare east of the Missouri. A few are still found in the Adirondac region of New York, as also in the Alleghanies of Pennsylvania, Virginia, North Carolina, and even Alabama, according to some accounts. Their remains in the bone caves of Pennsylvania are very numerous, showing that they were once very abundant there.

At one time the fur of the beaver was very valuable, and an extensive trade was carried on, so that the animal rapidly diminished in numbers. The substitution of silk, and the introduction of the nutria fur, (*Myopotamus coypus* of South America,) has greatly reduced the demand and the price, so that now beaver fur is not worth more than a few dollars a pound. In consequence, it scarcely pays the expenses of a systematic and laborious pursuit on the part of the trapper, and the beaver is again multiplying very rapidly, so that the western streams are becoming rapidly stocked again.

Fossil American Beaver.—The bone caves at Carlisle yielded a large number of remains of beaver, both young and old. There are no satisfactory points of difference from the existing species, although in size some of the teeth are larger than any recent specimens I have seen, indicating a length of quite six inches for the skull. There are a good many jaws, with the anterior deciduous first molar still implanted. These are provided with distinct roots. The upper one has three roots, one broad posterior one, and two anterior; the exterior one longer and a little forward of the other. The lower molar has two roots, one posterior very broad, the anterior smaller. The patterns of the teeth do not differ essentially from their successors, although the crowns are narrower.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.					Collected by—
								Nose to occiput.	Nose to tail.	Tail verteb.	Tail, width.	Hind ft., length	
78			Fort Union, Neb.	Winter.	Ed. T. Denig and A. Culbertson.		Skin						
1547			Upper Missouri		Dr. F. V. Hayden		do.						
1548 ¹			do.		do.		do.	35.00	11.00	5.50	6.00		
1549			do.		do.		do.						
1550			do.		do.		do.						
			do.		do.		Nine skulls						
823			do.		T. Culbertson		Skull						
209	1180		Milk river, Neb.	1853.	Gov. I. I. Stevens		Skin						Dr. G. Suckley.
	2270		Lake Superior.		Dr. J. S. Newberry		Skull						
	1072		St. Lawrence county, N Y		Dr. Hough		do.						
1901	2599	♂	Medicine Bow creek, Neb.	Aug. 10, 1856.	Lt. F. T. Bryan, U. S. A.	241	Skin	5.00	15.50	9.50			W. S. Wood.
1648			Fort Chadbourne, Tex.		Dr. E. Swift, U. S. A.		do.						
1398		○	Fort McKavitt, Tex.		Dr. W. W. Anderson, U. S. A.		In alcohol.	3.00	18.50	4.50	1.17	2.67	
	1415		Matamoras, Mex.		Lt. Couch, U. S. A.		Skull						Dr. L. Berlandier
	1416		do.		do.		do.						do.
	1414		do.		do.		Skeleton, pt						do.
	1003	♂	Rio Grande, Tex.		Maj. W. H. Emory, U. S. A.		Skull						J. H. Clark
1337			Colorado bottom, Cal.		do.		Skin	29.50	10.00			6.25	A. Schott
1198			Chehalis prairie, W. T.	July, 1855	Dr. J. G. Cooper		do.						

¹ Nose to eye, 2.75.

CASTOROIDES, Foster.

Molars $\frac{4-4}{4-4}$, rootless; incisors grooved longitudinally on the outside, consisting of thin laminae of dentine encircled by closed rings of enamel, united by cement. Of these rings there are three in each tooth, except the first upper and last lower, which have four.

CASTOROIDES OHIOENSIS, Foster.

Castoroides ohioensis, J. W. FOSTER, 2d Report Geology of Ohio, 1838, 81; fig.

HALL, Bost. Jour. N. H. V, 1847, 385. (Geol. Position.)

WYMAN, Bost. Jour. Nat. Hist. Osteology, V, 1847, 391, 401.

I have thought proper to introduce a brief notice of this gigantic North American fossil mammal, both on account of its close relationship to the beavers and its great size, which considerably exceeds that of the Capybara, the largest of living rodents. In the intimate structure of the teeth it bears quite a resemblance to this animal, although totally different in other respects. Of any peculiarities of structure other than those of the skull we are thus far ignorant, in the entire absence of other remains.

Very few remains of *Castoroides* have hitherto been discovered; the best known specimens being those of a lower jaw from Ohio first brought to notice by Mr. Foster, and the nearly perfect skull obtained by Rev. Benjamin Hale, of Geneva College, and upon which was founded the able monograph of Messrs. Hall and Wyman, in the Journal of the Boston Society, as quoted above.

The following description of the principal characteristics of the skull of *Castoroides*, as compared with that of the beaver, is based chiefly on the excellent plates of the memoir above referred to.

The general form of the skull, as seen from above, is much as in *Castor*. The cranium is, however, much shorter, narrower, and less capacious, and the distance from the posterior margin of the zygomatic process of the temporal bone to the back part of the skull proportionally much less. The nasal bones preserve somewhat the same proportions, reaching, possibly, not quite so far back, but instead of occupying exactly one-third of the total length of the upper outline of the skull, take up more nearly two-fifths of the same length. The malar bone is much less massive, as for five-sevenths of its total axial length it is quite narrow, the upper and lower edges nearly parallel beyond the temporal bone, and curving gently upwards; after which it widens, with the sides again nearly parallel, and bending very rapidly upwards. Anteriorly, too, it is not prolonged so as to occupy the anterior external edge of the orbit and articulate with the lachrymal, but the upper maxillary constitutes altogether the anterior root of the zygoma, and forms the anterior wall of the orbit. The zygoma itself is situated much higher up on the side of the head than in *Castor*; its lower edge being but little more than half-way between the top of the head and the grinding surfaces of the molars, while in the beaver it is much nearer the latter. The lower edge of the anterior root of the zygoma being thrown so much higher up, the ante-orbital foramen ascends also, being midway on the side of the head, instead of much nearer the lower surface; this foramen appears no larger proportionally than in *Castor*, and is similarly placed anterior to the root of the zygoma; it is, however, more visible from the side, not being concealed by a bony plate.

The lachrymal bone is very small, and separates the frontal and maxillary bones in the ante-

rior angle of the orbit ; as already stated, the malar does not extend as far as this bone. The ante-orbital tubercle of the frontal, just posterior to the lachrymal, seems wanting in *Castoroides*, and the greatest contraction of the skull is across the parietal, not the frontal bones, as in *Castor*. This contraction, too, is decidedly behind the middle of the skull, instead of being considerably anterior to this point.

Owing to the more elevated position of the zygoma, the exterior inferior outline is much longer than the extero-anterior, and is nearly parallel with the crowns of the molars, instead of having the two lines just mentioned of the same length and the former one quite oblique.

The incisive foramina are very inconspicuous and short, nearer the molars than in *Castor*. The palate, however, is similarly furrowed. The palato-maxillary foramina are also small, and not so far back as the junction of the second and third molars. The posterior margin of the palate is slightly concave, instead of running out in an azygos process, and the emarginate notch passes forward, so as to separate a little the posterior molars. The inner wing of the pterygoid processes is bent inwards, so as to come into contact, by the convexity of the fold, with its fellow. The curious sub-quadrate pit or depression of the under surface of the occipital bone of *Castor* is not found in *Castoroides* ; the auditory bullae are much less.

The axial lines of the upper molars are much more convergent than in *Castor* ; and are longer in proportion, occupying more than one-fourth of the length of the skull ; posteriorly this line reaches within its own length of the occiput, while in *Castor* it falls short by more than one and a half lengths.

The pattern of the grinding surface of the molars is strikingly different from that of *Castor* ; instead of being formed by the indentation of longitudinal folds of one exterior enamel tube, one on the inside and three on the outside in the upper jaw, there are in each tooth three closed transverse loops of enamel, completely separated from each other by cement ; the posterior upper and the anterior lower molars having four. The incisors on their antero-external faces exhibit a number of broad shallow grooves. Their projection anteriorly seems much greater than in *Castor*. These teeth are much larger and stouter in every way, being three times as thick as those in a skull of *Castor*, half the length of *Castoroides*.

The length of the skull of *Castoroides* figured by Dr. Wyman, exceeds nine inches from the occiput to the end of the intermaxillary ; its greatest height is four inches ; greatest breadth between zygomata seven inches. The length of the skull of *Castor* which served for the preceding comparisons, is five inches ; height, two and a quarter ; width, three and three-quarters. *Castoroides* had, therefore, a skull about twice the linear dimensions of *Castor*, but much more than twice as massive, judging from the incisors ; its bulk may be reasonably assumed as six times that of the large beavers, which are known frequently to weigh 40 pounds ; this would give 240 pounds for the weight of *Castoroides*.

The specimen of Professors Hall and Wyman was obtained in Clyde, New York, in a swamp on the summit level between the waters of Lake Ontario on the north, and Cayuga and Seneca lakes on the south. It was found about eight feet below the surface in a muck bed about four feet thick, resting on sand with shells of *Planorbis*, *Cyclas*, &c., and separated from a similar layer on the surface by a stratum of fine sand with occasional seams of clay ; according to Professor Hall, it was found in a lacustrine formation subsequent to the drift.

There is still another fossil genus, *Trogontherium*, allied to the beaver and still more to *Castoroides*, which it closely resembles in the character of the teeth. This is found in peat bogs of Europe, and was about one-fifth larger than the beaver. Like *Castoroides*, it occurs in lacustrine formations over the drift.

FAMILY.

SACCOMYIDAE.

With large and distinct external cheek pouches. Upper lip hairy, not cleft. Molars, rooted or rootless, $\frac{4-4}{4-4}$. Temporal bone enormously developed. No post-orbital process of the frontal. The ante-orbital foramen either wanting, as such, or appearing far anterior to the base of the zygoma. The upper corner of the postero-inferior angle of the lower jaw nearly horizontal. A tubercle outside of the condyloid process, indicating the posterior extremity of the incisor. Tibia and fibula united. Generally but five toes, with distinct claws on each foot. Fore claws longer than hinder. Coecum distinct. Pelage composed of stiff hairs, without any under fur.

The above characters serve to define one of the most natural families of the *Rodentia*, although the component genera have been widely separated by different authors. In the external cheek pouches there is no other family which exhibits any approach to it. These open outside of the mouth and are of variable depth, and lined with short hairs to the bottom. When inverted and dried, they look like sacks on each side of the head. While other characteristics are shared by one or other of the different families of Rodents, the *Sacommyidae* possess the common character of the external cheek pouches, as distinguished from all others. From the *Leporidae*, the lack of a second pair of upper incisors, behind the first, will at once distinguish them, independently of the other totally irreconcilable features. The *Hystriidae*, although having the same dental formula, may be at once known by the very large ante-orbital foramen in the zygomatic process of the maxillary as well as by the separated tibia and fibula. (?) The having four lower molars instead of two or three, with the lack of the ante-orbital foramen separates them from the *Muridae*, although they agree in the united tibia and fibula; this, however, separates them again from the *Sciuridae*. The nearest approach is seen, perhaps, in the beavers, *Castorinae*, which, differing altogether in external form, have certainly a close resemblance in the skull. The most striking points of distinction are seen in the deep malar bone which extends up along the zygomatic plate of the maxillary to the lachrymal and backward posterior to the molar. Many others, however, could be enumerated.

There are two very distinct sub-families in this group, typified by *Geomys* and *Dipodomys*, agreeing in the family characters, yet very distinct from each other and especially in external form; the one being the most clumsy, thickset, and sluggish of American rodents; the other the most delicate, graceful, and agile. Yet the differences are owing to the greater or less development merely of common conditions. These may be briefly characterized as follows:

Geomyinae.—Hind legs very short; fore claws enormously developed; tail short; mastoid portion of temporal not forming part of upper surface of skull.

Sacommyinae.—Hind legs and tail very long; fore feet moderate; mastoid bone very large, occupying much of upper surface of skull.

Brandt, in his recent paper on the classification of the Rodentia in *Beiträge zur nähern Kenntniss der Säugethiere Russlands*, 1855, 188, establishes a family of *Sciuro-spalacoides* to contain *Geomys* and *Thomomys*, as constituting a connecting link between the *Sciuridae* and a family of *Spalacoides*, typified by *Spalax*, *Siphneus*, *Ellobius*, &c. He dissents from the views

of Waterhouse in combining *Geomys* and *Thomomys* into a family with *Perognathus* and *Dipodomys*. *Perognathus* he considers rather as a Muroid, and coming next to *Cricetus*, while *Dipodomys*, or rather *Macrocolus*, is placed as the type of a sub-family *Macrocolini* under the *Dipodoides*. I think, however, a revision of the subject, with more ample materials before him, will satisfy this eminent zoologist of the soundness of Waterhouse's view. The common characters of external cheek pouches, five distinct fingers each, with a separate claw on the fore feet, the stiff rigid hair, and the many common osteological peculiarities, are quite enough to separate them from all others, while in the essentials of structure they agree quite as well among themselves as do the agile and graceful long-tailed squirrels and the short-tailed marmots, or the various extreme structural types of the *Muridae*.

SUB-FAMILY GEOMYINAE.

Skull massive; incisors very large and thick. The ante-orbital foramen small, appearing far forward on the side of the muzzle. The nasals extended but little beyond the incisors. Mastoid bone restricted to the occiput. Occipital bone broad, forming the posterior portion of the skull or the occiput. Body thick-set and clumsy. Limbs about equal, and all very short; fore claws enormously developed, five in number.

The above characters are among the most striking as distinguishing this family from the *Sacomyinae*, although many others will be found detailed in the descriptions of the genera themselves. The species of *Geomyinae*, in fact, are as different in appearance from the *Sacomyinae* as is well possible; the one being clumsy, short limbed, squat, almost entirely subterranean, and so strictly nocturnal, that many persons who have daily seen hundreds of their mounds have never in their lives observed the living animal; while the typical *Sacomyinae* are graceful, agile, and with a development of limb and tail every way equal that of the Jerboas; the individuals themselves well and familiarly known in their native localities.

Some further characteristics of the *Geomyinae* are found in the very great contraction of the skull between the orbits, which there is narrower than the snout. The palate is horizontal only between the molars; anteriorly it rises very rapidly to near the incisors, leaving a deep concavity between the molars and incisors. Its plane, likewise, is much below that of the base of the cranium. The *meatus auditorius externus* is a tube projecting forward and embraced in a notch of the squamous portion of the temporal.

The genera *Geomys* and *Thomomys*, composing the *Geomyinae*, are very closely related, and in fact differ comparatively little among themselves; the points of distinction from others are, however, for the most part, very appreciable. All are confined to North America and Mexico, and in certain localities west of the Mississippi are very abundant.

The difficulties in determining the species of *Geomys* and *Thomomys* have always been very great, owing to various causes. In the first place, there is the same trouble in procuring specimens of this as of all other subterranean animals, as they rarely see the light, and sometimes are never observed even by persons who have lived for years in districts quite densely inhabited by them. They vary, too, with age and season to a considerable extent, so that in the small number of specimens seen by naturalists, at least of the far western species, each one has almost served as the type of a distinct species. There is a very strong resemblance among all the members of the genus, and owing to their peculiar conformation, the points of structure affording good distinctive features are easily distorted or obscured. The best characters are, perhaps, to

be derived from the fore feet or hand ; the size and shape of the claws, and their proportion to the whole hand ; the length of the digits and palm, and the position and extension of the thumb ; but many of these points cannot be taken into consideration unless the hand is perfectly straight and bent at a considerable angle to the fore arm, which is seldom if ever the case, unless specially attended to in drying, owing to the contraction and flexure of the joints. The tail is apt to vary greatly in measuring different skins of the same species, owing to the fact that the skin and flesh of the body encircles it to a considerable distance beyond its base, the tail itself appearing to spring from the extremity of a cone. In preparing the specimens, if the entire vertebræ are left in, the skin thus encircling the basal portion of the tail may, in drying, enclose the vertebræ firmly and closely, and thus the entire length be indicated. As frequently, however, the vertebræ are taken out or cut off and the basal portion stuffed out, entirely obliterating in that region any vestige whatever of this appendage, represented only by the extremity. It is, in all cases, a good rule to measure from the end of the dorsal skin, or where the peculiar short fur of the tail begins, even though other measurements be indicated.

These animals, too, are more than usually liable to being overstuffed, so as to indicate a length of body several inches greater than in nature.

GEOMYS, Rafinesque.

Geomys, RAFINESQUE, Amer. Monthly Magazine, II, November, 1817, 45.

Diplostoma, RAF.—*Id.* (in part)

Saccophorus, KÜHL, Beiträge, 1820, 65.

Pseudostoma, SAY, Long's Exped. R. Mts. I, 1823, 406.

AUD. & BACH. N. Am. Quad. I, 1849.

Ascomys, LICHTENSTEIN, Abh. Berl. Akad. for 1822-'23, (1825,) 20.

BRANTS, Het Geslacht der Muizen, 1827, 23.

WAGNER, Suppl. Schreber, III, 1843, 380.

A large groove near the central line of the upper incisor. Skull large and massive; zygomata thickened. Anterior upper molar, with the two lobes elliptical, much elongated transversely and approximated, nearly equal. Middle two with the outlines regularly elliptical. Posterior lower molar sub-elliptical. Ears obsolete.

a. A second fine groove near the inner edge of upper incisors. Fore feet much larger than the hinder ones. Third claw of hand greatly developed; second claw reaching only to the middle of the fourth.

b. Only one groove on or near the central line. Fore and hind feet nearly equal. Third claw much developed; second claw and finger nearly as long as the fourth claw.

Form of body thick-set, cylindrical; heaviest anteriorly, especially about the head. There is no indication of a neck; on the contrary, the thickest portion is at the back part of the head, from which the body tapers gradually to the tail, widening a little across the thighs. The nostrils are small, elliptical, with a papilla above; they are quite distant apart, situated laterally on each side of a blunt muzzle. This muzzle has a broad furrow down the middle, with a slight ridge at the bottom of the furrow. The muzzle is bounded above by a horizontal furrow having an overhanging ridge, which is coated with short hairs at its upper portion. The upper lip is not cleft, but passes almost directly in a straight or slightly concave line across the bases of the incisors; the space between this outline and the naked muzzle (almost as high as the muzzle itself) being coated with short hairs.

The opening of the mouth is quite diminutive, although there is an anterior chamber behind the incisors which narrows behind to the true mouth. The skin lining this chamber (which extends above almost as far back as the molars) is covered with short hair, except, perhaps, just back of the upper incisors, where there is a naked space bounded by a short fold of skin. The lower lip is tumid, quite free, and capable of much motion round the incisors. The upper wall of the cheek pouches begins at a point which forms an equilateral triangle with the end of the upper incisors and the nostril; it ends about opposite the posterior extremity of the lower side of the lower jaw. The plane of the opening is nearly parallel with the vertebral line. The pouch runs back to the middle of the scapula, and is capable of much distension. It is well clothed with hair on the side next the head; on the other it is nearly naked with a few scattered hairs. The ears are very rudimentary, represented only by a thickened ridge of skin, narrowest above and widening below. In drying, this ridge disappears almost entirely. The tail is thickened, though tapering somewhat to the tip, which is blunt and naked for about half an inch, and appears to possess some degree of tactile sensibility, as in the opossum. It is hairy, except at the end.

The upper surfaces of all the feet are covered with short hairs, but they are perfectly smooth and rather tumid below. There is a very large tubercle at the base of the palm, divided by a longitudinal groove which passes round behind the inner smaller portion. From the posterior

edge of the larger and exterior portion of this tubercle is an obliquely inserted fringe of short stiff hairs. The fingers and claws are capable of complete flexure on the palm, the longest claw reaching exactly to this fringe. The claws are all long, curved, compressed, and trenchant below. The claws on the hind feet are much smaller, though thick, stout, and conical. The second is, however, expanded into a spoon shape at the end, a character sometimes seen in the first likewise.

Skeleton.—The skull of *Geomys* is broad and heavy, and considerably depressed; the muzzle broad above, with the sides throughout nearly parallel, or even wider near the end. Its general shape, in fact, is more or less quadrate, with the broad muzzle projecting in front for from two-fifths to two-sixths the total length. The cranium, with its brain cavity, is small; and in consequence of the widely separated zygomata, the orbits are very large, and unusually open when viewed from above. The molars are small; but the incisors, as well as the entire lower jaw, are enormously thick and massive.

The nasal bones are elongated, rather narrow anteriorly, and tapering behind to a blunt point. Their backward projection falls considerably short of the posterior extremity of the nasal process of the intermaxillary, which itself reaches to the line of the lachrymals. The nasal process of the intermaxillary is broader midway than the nasal, and makes its appearance on the top of the skull near the end of the muzzle. Its suture with the frontal is difficult to define in the adult, though that with the nasal is always distinct.

The frontal bones are much reduced in dimensions, owing to the great contraction of the skull between the orbits, the interval here being considerably less than the width of the snout. Their width (the two conjoined, the suture being obliterated at a very early age) is about the same before and behind; they are much hollowed out laterally, and anteriorly exhibit three processes: one central, passing forward to articulate with the nasal; the others lateral and pointed, wedging in between the nasal process of the intermaxillary, and the zygomatic of the maxillary, the lachrymal resting against their outer bases. Postero-laterally the frontals are in extended apposition with the very greatly developed squamous portion of the temporal, which, coming up on the superior surface of the skull, covers two-thirds of the whole from the middle of the bony orbit to the occipito-parietal crest. The parietals are thus almost concealed, being excluded from the orbit, and occupying a rather narrow space in the top of the skull, and embraced within the frontals, temporals, and occipitals.

The occipital bone is quite fully developed, and forms the posterior portion of the skull or occiput, which is truncate and broad, and perpendicular to a horizontal plane. The mastoid portion of the temporal, as in other *Sacommyina*, is visible in great part postero-laterally. The basilar process of the occipital is rather narrow, and its sides are in close contact with the petrous bone, without any foramen lacerum between.

Attention has already been called to the unusually great development of the squamous portion of the temporal bone. This occupies the entire lateral portion of the superior surface of the cranium, the two squamous bones of opposite sides occupying at least two-thirds of the whole. Anteriorly it constitutes the interno-posterior wall of the bony orbit, posteriorly it forms the exterior portion of the occipital crest, and in a notch on the side behind the zygomatic process is seen the tube of the meatus auditorius externus. The glenoid cavity of this bone is long and rather open, its axes converging anteriorly. The outer boundary is constituted entirely by the malar process of the temporal, which extends forwards after bending over the short malar bone. The mastoid and petrous portion of the temporal are in one bone, entirely

distinct from the squamous. They are of considerable extent, entering into the occipital surface, and very largely into the under part of the cranium. The meatus externus is broad and tubular, with thin walls, its axis projecting forwards, outwards, and upwards; and it is embraced posteriorly by a thickened process of the squamous bone.

The malar bone is very short; its posterior half is concealed from view from above by the process of the temporal; anteriorly it is more or less enlarged, and fits into a notch of the zygomatic plate of the maxillary, which forms the whole anterior portion of the zygoma, and sends a thin plate backwards under the malar. Thus, in consequence of the forward projection of the temporal on the upper surface of the zygoma, and the backward projection of the maxillary on the under, the two points leave but a slight interval between them when the malar bone is removed.

The bony palate of *Geomys* is much restricted, being really confined to a narrow space between the molars. This is convergent anteriorly, where it is not wider than the molars; it is traversed by two deep grooves, leaving a central and two lateral ridges of nearly equal height; the central one is prolonged anteriorly to the incisive foramina. A plane tangent to the surface just described would show a considerable interval between it and the cranium or petrous bones behind, and a still greater one in front, the outline of the under surface of the bone rising rapidly from the molars to near the incisors, and then curving a little down again. The palatine surface here is narrow, the cross section being truncate wedge-shaped, the outline widening above. The intermaxillary suture is seen on the side of the muzzle, about its middle; just within it is seen a deep depression, at the bottom of which is the anterior termination of the ante-orbital foramen; this, however, does not open through the bone into the nasal cavity, as in *Dipodomys*. The incisive foramina are entirely in the intermaxillaries. The zygomatic plate of the maxillary is broad and oblique, standing out in a plane perpendicular to the axis of the skull (the two of opposite sides being nearly in the same plane); it is nearly plane anteriorly; its lower margin rises rapidly from the alveoli of the molars to a point opposite the centre of the skull, and then curves somewhat downward again; it is thickened superiorly with a flattened surface, which expands behind to receive in its notch the end of the malar.

It has already been stated that the lower jaw is very massive; much more so than in any other American rodents. There is scarcely any postero-inferior angle, this being represented by a compressed ridge posteriorly, commencing below the root of the last molar. The upper portion of this ridge turns off horizontally, however, and is continuous with a horizontal thickened process standing out perpendicularly to the side of the jaw; this represents the upper corner of the postero-inferior angle. The lower outline of the jaw is a nearly equable and convex curve throughout, mostly parallel to the inferior surface of the incisor. The condyloid has scarcely any neck, although rather a deep notch separates it from the coronoid process, which rises considerably above the level of the condyle. There is a very deep pit below the base of the coronoid process, and exterior to the last molar. The covering of the posterior extremity of the lower incisor is seen as a very prominent tubercle (larger than the condyle) which is situated on the outside of the jaw, and at a height about midway between the condyle and the horizontal process already described. There is also an excavation or pit running along the outside of the jaw, internal and anterior to this tubercle.

The incisors, as already remarked, are of extraordinary strength and size; more or less plane anteriorly; the upper grooved, the lower perfectly smooth. A section of the teeth is wedge-shaped; the base anterior. The groove in the upper incisor is either central, or central and a

finer one near the inner edge; (in *Thomomys* the large central groove is wanting, leaving the fine internal one.) The upper incisors are much curved, and describe nearly a full semicircle, passing round almost to the base of the root of the anterior molar. In the lower jaw the arc is also about a semicircle, reaching to the side of the base of the condyloid process.

The upper molars are considerably convergent anteriorly, their inner lines intersecting (if produced) in the incisive foramina. They are all rootless, and diverging widely at their bases; the anterior is inserted very obliquely forward, at an angle of about 45° with the axis of the skull; the others more and more near to the perpendicular, and curved, the convexity anterior, yet without becoming quite perpendicular. The lower molars are equally oblique, except that here the posterior is most inclined, and that backwards; in fact, in its curvature it stands quite parallel to the incisor. The anterior upper molar consists of two regular ellipses, much elongated transversely, of about equal size, and connected by a narrow isthmus which crosses between their middle portions, or a little interior to this; the second and third molars succeeding are simple ellipses, of nearly equal size—the second rather largest, the third about equal to the ellipses of the first; the last molar is longer, and irregularly three, four, or five sided. The crowns of the first lower molars show, also, the two ellipses, the anterior smallest, the bridge at about the centre; the remaining teeth are also elliptical, the posterior one narrowest.

In the skeleton of *Geomys*, (*G. bursarius*, No. 1760,) we find the limbs, though short, to be quite massive, the anterior indeed appreciably stouter than the posterior. The vertebral column is short, but the component vertebræ broad and firmly knit together. The neck is very short, its seven component vertebræ measuring only about $\frac{3}{10}$ the length of the skull. The second cervical vertebra is large and massive, with a compressed short upper spinous process. The vertebral formula is 7 cervical, 12 dorsal, 7 lumbar, 5 sacral, and 17 caudal. The posterior two sacral vertebræ have their transverse processes ankylosed and expanded so as to come into firm union with the ossa innominata, leaving a wide foramen on each side of the spine, between this junction with the sacrum and that anterior to it, in which the first and second sacral are involved. The bones of the fore leg are stouter than the hinder. The olecranon process is much lengthened, its projection behind the centre of the joint being nearly one-third the whole length of the ulna. The clavicles are well developed. The tibia and fibula are united a little below the middle of the former, and diverge widely above.

The species of *Geomys* are confined to the regions east of the Rocky mountains, and, in fact, have not yet been observed much west of the Mississippi, or near the mountains. They are very abundant in Missouri, Iowa, and southern and western Illinois; they exist also in Texas and all the Gulf States. Florida and Georgia also possess one, possibly two, species, but none have yet been found on the Atlantic coast north of the Savannah river. Southward they reach into Mexico, and, possibly, as far as Central America.

The species are termed “gophers” in the west, but in Georgia and Florida they are almost universally called “salamanders.” Where this latter name is prevalent the term “gopher” is equally well understood to mean the large land tortoise, *Testudo polyphemus*, to which the Savannah river also serves as a barrier. When either of these names is used, therefore, by any individual, it becomes necessary first to ascertain his region of country before it can be told whether a mammal or reptile is in question.

From the list of synonymes at the head of this article it will be seen that many genera have been proposed for the gophers. The first, in point of date, is *Diplostoma*, of Rafinesque, based on reported characters of the Missouri species. With several accurate indications, we are told

that the "animal has no tail, no ears, eyes covered by the skin, and four toes to all the feet." This is, of course, entirely erroneous, and renders it necessary to avoid this name. The genus *Geomys* is, however, sufficiently characterized in the next paragraph to answer very well for this group, and must be adopted.¹ The genera succeeding, in point of date, though all sufficiently appropriate to the gophers, are, of course, superseded by *Geomys*.

The following brief synopsis may serve to facilitate the determination of species of *Geomys*.

A. UPPER INCISOR WITH TWO GROOVES.

Upper incisor with two grooves, a narrow one near the inner edge, and a deep wide one on or external to the central line of the tooth. Fore feet longer than the hinder, owing to the great development of the fore claws.

1. Inner groove always distinct; large groove partly involving the central line of the incisor. Size large, 7 to 8 inches, fore feet exceeding $1\frac{1}{2}$ inches, its longest claw three-quarters of an inch..... *bursarius*.
2. Similar to the last, but smaller, 5 to 6 inches; fore feet less than $1\frac{1}{2}$ inches; its longest claw scarcely over half an inch..... *breviceps*.
3. Inner groove obsolete in old age; large groove situated external to the central line *pinetis*.

B. UPPER INCISOR WITH ONE GROOVE.

Upper incisor with one large groove exactly in the central portion of the tooth. Fore feet not longer, or not as long, as the hinder.

4. Color nearly uniform yellowish brown..... *darkii*.
5. Color, yellowish brown. Sides of face and head chestnut..... *castanops*.
6. Color, dark reddish chestnut. Hair very stiff..... *hispidus*.
7. Very large size. Grayish brown. Hair soft..... *mexicanus*.

GEOMYS BURSARIUS.

Pouched Gopher.

- Mus bursarius*, SHAW, Linnaean Transactions, V, 1800, 237.—*IB.* Gen. Zool. II, 1801, 100; pl. cxxxviii.
MITCHILL, Am. Jour. Sc. IV, 1822, 183.
- Cricetus bursarius*, "DESM. Nouv. Dict. XIV, 177." *IB.* Mamm. II, 1822, 312.
GRIFF. Cuv. III, 1827, 138; plate.—*IB.* V, 1827, 235.
"F. Cuv. Dict. des Sc. Nat. XX, 257."
- Saccophorus bursarius*, KUBL, Beiträge, 1820, 65.
FISCHER, Synopsis, 1829, 304.
- Pseudostoma bursarius*, SAY, Long's Exped. R. Mts. I, 1823, 406.
HARLAN, Fauna Amer. 1825, 153.
GODMAN, Am. N. H. II, 90.
AUD. & BACH. N. Am. Quad. I, 1849, 332; pl. xliv.
- Geomys bursarius*, RICH. F. BOR. Am. I, 1829, 203.
- Ascomys bursarius*, EYDOUX ET GERVAIS, Voyage de la Favorite, V, 1839, 23.
- ? *Mus ludovicianus*, ORD, Guthrie's Geog. 2d Am. ed. II, 1815, 292. (Not determinable.)
- Mus saccatus*, MITCHILL, N. Y. Medical Repository, XXI, Jan. to June 1821, 249. (From west of Lake Superior. Plumbago colored var.)
- Ascomys canadensis*, LICHT. Abh. Berl. Akad. 1825, 13; fig.
BRANTS, Muizen, 1827, 24.
WAGNER, Suppl. Schreb. III, 1843, 383.—*IB.* Abh. K. Baier. Akad. München, XXII, 1846, 327 (figure of skeleton).
- Geomys canadensis*, LECONTE, Pr. Phil. Ac. N. Sc. VI, 1852, 158.

¹ "Feet short, all with five toes and nails; those of the fore feet very long. Mouth as in the genus *Cricetus*, and with exterior pouches. Tail round and naked."—(Rafinesque, Am. Month. Magazine, II, 1817, 45.)

Geomys oregonensis, LECONTE, Pr. Phil. Ac. N. Sc. VI, Sept. 1852, 160.

Gopher ; *Pocket gopher* ; *pouched rat*. VULGO.

SP. CH.—Upper incisors, with a small groove near the inner edge, and a much larger one bisecting the remaining space. Fore feet considerably longer than the hinder ones. Second claw reaching to about the middle of the fourth. Cheek pouches ample.

Color.—Reddish brown above, with a plumbeous tinge along the vertebral region. Under parts paler and more yellowish. Inside of pouches reddish brown in parts. Skull sub-elongated, the zygomata converging as straight lines behind—widest apart at the end of the superior maxillary process. Forehead convex.

Sometimes dark plumbago colored above ; tinged with brownish beneath.

The upper incisors of this species have a small, not very acute, groove close along the inner edge, and a second much deeper and more conspicuous one half way between the first and the outer edge of the incisor. This second groove is rounded at the bottom and on the sides, and the two portions of the incisors on either side are nearly symmetrical in shape and entirely rounded, no portion of their anterior surface being plane ; the incisors of both jaws are about as wide as they are deep, the axes of their cross sections being nearly equal.

The ears are entirely obsolete, or represented merely by a thickening of the skin round the auditory aperture. The cheek pouches are very wide and well coated with hairs, except towards the bottom, where they are rather thin. The tail is contained not quite three times in the length of the body ; in some specimens it is densely hairy to the tip ; in others it is somewhat naked at the extremity ; in none examined could the tail be called naked.

The fore feet are considerably longer than the hinder ones ; the claws being excessively developed. The third claw, measured above and applied on the palmar surface, reaches from the end of the third finger to a little beyond the base of the border of the tubercle ; measured below, it occupies about three-eighths of the whole length ; the first claw reaches likewise over about three-eighths of the hand. The cleft between the second and third fingers is quite deep, extending almost half way from the end of the finger proper to the beginning of the hand. The fourth finger is decidedly longer than the second, and its claw is much larger and longer, the tip of the second claw only reaching about half way down the fourth, (measured below.) The first claw extends beyond the base of the fifth, and the fifth barely reaches the base of the second. On the hind feet the first claw reaches nearly half way between the tips of the fourth and fifth ; the second is much longer than the fourth, its claw reaching to the end of the third or longest toe ; the second claw being, in fact, the largest on the foot.

The upper parts are of a dark reddish or chestnut brown along the middle of the back, glossed with plumbeous ; the sides are rather paler, and the under parts are even of a yellowish brown. The edges of the mouth and the chin are yellowish white, as are the outer walls of the pouches ; the inner are chestnut. The tail is chestnut at the base ; at the extremity and the inferior surface generally it is whitish, as are the feet and the posterior edge of the arm. The hairs are everywhere plumbeous at the base, those on the central area of the back not varying materially at their tips.

These specimens may be considered to represent the genuine *Pseudostoma bursarius* of Say, as described in Long's Expedition, having been obtained from the same locality. There is, however, a *Geomys* from Iowa, in the collection of the National Institute, in Washington, which presents some important points of distinction. With a much larger body, and much stouter incisors, the tail is absolutely shorter, as well as the single vertebræ themselves, and the feet of much the same size. The grooves of the upper incisors are much as described in the

preceding specimens, except that the main furrow is more in the centre, and the portion on either side more nearly equal, including that covered and separated by the inner groove. The color is also quite different, being everywhere of a uniform and rather bright reddish brown, a little paler beneath. There is no darker wash along the back, where the hairs are very slightly darker at the points, only appreciable on close examination. These are everywhere plumbeous at base, in marked contrast to their extremities. The feet, tail, and inside of cheek pouches, are obscurely whitish.

Among the specimens before me are three from Morgan county, Illinois, which exhibit a coloration assigned by Audubon and Bachman to a particular season of the *G. bursarius*. In these, the body is of a dark plumbago color, deepest and very lustrous along the centre of the back. Beneath, the plumbeous hairs are tipped with yellowish gray; above, their extremities are only a little darker. The hands and posterior portion of the arm are clear white, in strong contrast to the surrounding fur. The bottom of the cheek pouches is also whitish. The tail whitish, except the basal half above, which is plumbeous.

The tail itself is long and well clothed with hair. The proportions of the limbs are not materially different from what has been described in *G. bursarius* from St. Louis. They may be a little smaller. The skull presents some differences: in a more deeply-grooved incisor; the centre of this groove a little nearer the inner edge; a more slender zygomatic arch, the edges of the zygomatic process of the upper maxillary being parallel, as viewed from above, instead of widening considerably to embrace the end of the malar. The molar teeth are rather broader, and the posterior lower one is nearly as wide as the one next to it. There is also a greater dissimilarity between the two lobes of the anterior upper molar. The incisors are decidedly thicker and more massive. If these differences are constant in many specimens, there will be no danger in separating the lead-colored ones as distinct.

Measurements.

	Red—Iowa.		1882, Black—Morgan co., Illinois.		614, Black—Illinois.			357, Red—St. Louis.	
	Inches and 100ths.	Lines.	Inches and 100ths.	Lines.	Inches and 100ths.	Lines.	Length.	Inches and 100ths.	Lines.
Nose to root of tail	11	-----	10	-----	8	6	-----	8	-----
Tail, from root to end of vertebræ	2	6	3	2	2	8	-----	3	-----
portion covered with short hairs	1	11	3	-----	2	6	-----	2	8
Arm, fore foot to end of claws	1	7½	1	8	1	6	-----	1	7
longest claw	-----	9	-----	9	-----	8½	-----	-----	9
Hand, without claw	-----	1	-----	-----	-----	11	-----	1	-----
third finger without claw	-----	4	-----	-----	-----	-----	-----	-----	5
second claw	-----	4½	-----	-----	-----	4	-----	-----	4½
its finger	-----	2	-----	-----	-----	-----	-----	-----	1½
fourth claw	-----	7	-----	-----	-----	6½	-----	-----	6½
its finger, (between third)	-----	2	-----	-----	-----	-----	-----	-----	1½
Leg, hind foot from heel to end of claws	1	5	1	5	1	2	-----	1	4½
longest claw, (second)	-----	2	Third	3	Third	2½	-----	-----	3
Skull, length	-----	-----	-----	-----	1.78	-----	-----	2.04	-----
width	-----	-----	-----	-----	1.05	-----	.59	1.28	-----

Dr. Leconte has recently described some specimens of *Geomys* in the collection of the Academy of Natural Sciences, and labelled as coming from the Columbia river, under the name of *G. oregonensis*, separating them from his *G. canadensis*, the typical species, on account of the hairiness of the tail. I have carefully examined these specimens, and can find no characters to distinguish them from the species found in Missouri. The characters given of hairy tails and white chin, dark red color, and darker back, are all found equally in both; indeed, I have yet to see a reddish brown adult *Geomys*, having bisulcate incisors, with an entirely naked tail, as an original character. I have satisfied myself that the hairs on the tail are liable to fall out in patches, and especially is this the case when the vertebræ are removed.

Nor am I satisfied that these specimens were collected in or west of the Rocky Mountains at all. Mr. Townsend made numerous collections from St. Louis west, and among these must have been the pouched rats of Missouri, so striking to an eastern naturalist who had never before seen them. Yet no mention is made of any specimens in his collections, except those of Oregon. Furthermore, in the list of mammals published in his Narrative, as having been seen in Oregon, this "*Geomys bursarius*," (as his specimens are labelled,) does not appear at all. Richardson never heard of it in Oregon; nor have either Dr. Cooper or Dr. Suckley, who have already spent more than two years in Oregon and Washington Territories, ever collected or mentioned it. These gentlemen express great surprise at failing to find so many species of birds and mammals mentioned by Townsend as occurring in Oregon, although their time has so long been devoted almost exclusively to the natural history of that region. I fear, therefore, that, in the long interval which elapsed between the collecting of his specimens and their determination, owing to the loss or misplacing of labels, some at least have been referred to incorrect localities.

The accumulation of a much greater amount of material than that at my command when the preceding article was written, enables me to speak more fully in regard to several matters formerly in uncertainty. There appears to be little doubt that the plumbeous varieties and the chestnut brown ones are the same species, as they are associated in so many localities.

Specimens vary in the amount of hair on the tail as well in the size of the claws. As a general rule, the tail is pretty closely but thinly covered with short lustrous hairs that lie flat to the skin. In some specimens the extreme tip of the tail is naked, in others it is bare for the terminal third. In none before me is it entirely naked.

The size of the incisor teeth appears to vary somewhat, independently of the size of the skin, and the same may be said of the claws. These become not only longer but higher and stronger every way with age. The colors of the chestnut-colored specimens are generally of pretty much the same tint; the plumbago-colored ones are sometimes uniform both on back and belly; sometimes with a wash of chestnut on the belly. In all I have seen, the whole fore legs were white.

The first description of this animal was by Shaw, and was based on a drawing communicated to him by General Davies of an animal said to have been brought from some portion of interior Canada. It is characterized simply as "ash-colored, with short, round, nearly naked tail, pouched cheeks, and the claws of the fore feet very large, formed for burrowing in the ground." The figure represents a species with stuffed sacks on each side of the head, (the

everted pouches,) three claws to the fore feet, six to the hinder ones, and a hairy tail. Subsequently, however, Shaw improved upon this description, having obtained the original specimen, although still under the impression that the cheek pouches opened from the inside of the mouth.

The same skin referred to by Shaw was subsequently investigated by Kuhl, and then by Lichtenstein. It was for a time in the celebrated museum of Mr. Bullock, of London, and is said to have been purchased by Temminck at the sale of this collection, and is doubtless now in the Leyden museum.

For a long time it was supposed that the pouches in all the American gophers were naturally external and pendulous, with their opening inside the mouth. Even Richardson was of opinion that his *Geomys douglassii*, and perhaps some other species, were of this character. It is, perhaps, scarcely necessary to say that it is now a well ascertained fact that in all the species these pouches open outside of the mouth.

The geographical distribution of this species is not yet fully ascertained. It is known to occur throughout Missouri, eastern Kansas and part of Nebraska, western and southern Illinois, Iowa, western Wisconsin, and part of Minnesota. Its extreme northern limit has not been ascertained.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										Collected by—				
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of free portion.	Fore fl., length.	Hind fl., length.	Longest fore claw.	Height of fore claw.		Length of skull.	Width of skull.	Width of muzzle.	Width of incisors
357 ¹	1271	♂	St. Louis, Mo.		Dr. Geo. Engelmann.	Skin; red.				8.00	3.00	2.67	1.60	1.38	.53	.16	2.05	1.26	.42	.23	
358	1272	♀	do.		do.	do.			8.00	2.30				1.15	.60	.15					
620 ¹	1767		do.		do.	do.			7.17	3.00							1.93	1.20	.38		
2635			do.		do.	In alc.; red.	1.07	1.75	2.20	7.08	2.78		1.52	1.33	.64	.19				.22	
2636			do.		do.	do.	1.22	1.85	2.60	7.55	3.38		1.57	1.37	.70	.20				.25	
2637			do.		do.	do.					2.81		1.32	1.50	.60	.16					
	1768		do.		do.	Skull											1.75	.99	.37	.20	
2633			S. Illinois.		R. Kennicott.	In alc.; black.	1.00	1.45	1.90	5.75	2.67		1.50	1.12	.68	.17				.20	
614 ¹	1760		Illinois		T. S. Parvin.	Skin; black.				8.50	2.67	2.50	1.50	1.20	.70		1.76	1.05	.37	.21	
1882		♀	Jacksonville, Ill.		Thos. Kite.	do.				10.00	3.17	3.00	1.67	1.42	.75						
780	1882		Tremont, Ill.		W. J. Shaw	do.				8.50	2.30				.76	.17	2.24	1.42	.45	.26	
2539 ¹			Lyons, Iowa.	April, 1857	R. Kennicott.	In alc.; red.	1.28	2.10	2.33	8.90	3.30			1.48	.77	.92				.26	David Hess.
1384			Plum Spring, Iowa.		B. F. Odell	In alc.	1.12	1.70			2.15		1.55	1.30	.68	.20				.24	
1235			Quasqueton, Iowa.		Dr. Bidwell	Skin; red.				9.00				1.43	.90	.20				.25	
1236			do.		do.	do.				7.72	2.17			1.30	.75	.19				.27	
	2079		do.		do.	Skull.											2.20	1.35	.45	.30	
	2080		do.		do.	do.											1.72	1.00	.35	.22	
	2487		Burlington, Iowa.		T. Glover	do.											2.25		.43	.26	
91			Columbia river, O. T.? ²		Phil. Acad. Nat. Sciences.	Mounted; red.															J. K. Townsend
1775 ¹	2497		Mouth of Vermilion river, Nebraska.	Oct. 25, 1856	Lt. G. K. Warren	Skin; red.	.75	1.75	2.25	8.00			1.75	1.25	.76	.15					Dr. F. V. Hayden.
2949			Fort Riley, K. T.		Dr. W. A. Hammond	do.															

¹ In all probability Missouri.² Measured before skinning.

GEOMYS BREVICEPS, Baird.

Short-headed Gopher.

Geomys breviceps, BAIRD, Pr. Ph. Acad. Nat. Sc. VII, April, 1855, 334.

SP. CH.—Upper incisors with a small groove near the inner edge, and a much larger one bisecting the remaining space. Fore feet decidedly longer than the hinder ones. The second claw reaching half way down the fourth. Cheek pouches quite ample.

Colors.—Above, dark chestnut brown, with cloudings caused by darker tips to the hairs. Beneath, paler, mixed with grayish. Inside of pouches and surrounding region entirely yellowish white. Skull short, broad. Forehead plane. Outline of zygomata, as viewed from above, curved; separated most widely at the junction of malar and temporal.

This species, from the indications afforded by the skulls of the two specimens under examination, is much the smallest of those with bisulcate incisors. The ears are quite obsolete in one specimen; in another, rather more distinct than usual in this group of *Geomys*, the encircling ridge of skin being quite prominent. The whiskers are very short. The cheek pouches are large and deep, amply coated with hair everywhere. The tail is contained between two and three times in the length of the body. It is scantily coated with hair, most densely near the base. The fur is moderately full and soft, more so than in *G. bursarius*.

The furrowing of the incisors is much as in *G. bursarius* from St. Louis. The inner groove is, however, somewhat narrower and shorter. The main groove bisects the portion exterior to the inner groove, the halves being symmetrical and rounded.

The fore feet or hands are but little longer than the hind feet; their claws are very large and stout. The middle claw, measured above, reaches from the end of its finger to the tubercle of the palm; its under surface occupies a little more than one-third of the whole hand. The first finger is very rudimentary, its claw only reaching over about one-third the hand, and extending barely to the end of the fifth finger. The second finger is considerably shorter than the fourth, and its claw only reaches to about the middle of the fourth claw, and to the end of the third finger. The fifth claw extends beyond the end of the second finger. On the hind feet, the first and fifth toes are almost rudimentary, especially the latter. The claw of the fifth reaches to the base of the first claw; the second claw reaches to the end of the third toe; the fourth claw a little beyond the base of the second. The second claw is about as long as the third, and widened at the end.

The color is not markedly different from the St. Louis species. The upper parts are of a dark chestnut brown; the ends of the hairs tipped with still darker along the middle and posterior portion of the back, imparting an indistinct clouding to the color. The under parts are of a paler tint of the same mixed with greyish, and showing a good deal of the plumbeous bases of the hairs.

The inside and edges of the cheek pouches, lips, chin, throat, hands and posterior edge of the fore legs, are of a uniform yellowish white, perhaps quite white when not altered by alcohol. The tail is obscurely white beneath and dusky above.

Measurements.

	Inches and hundredths.	Lines.
Nose to root of tail.....	6	9
Tail, from root to end of vertebræ, uncertain.....	2	2
short haired portion, uncertain.....	1	8
Arm, fore foot to end of claws.....	1	1½
longest claw.....		6
Hand, without claw.....		8½
third finger, without claw.....		3½
second claw.....		3½
its finger.....		2
fourth claw.....		5
its finger, (between third).....		2½
Skull, length.....	1.55	-----
width.....	.98	-----

As stated, this species exhibits considerable resemblance in color to *G. bursarius* from St. Louis. The tint is, however, more uniform on the back and sides, without the concentrated wash on the dorsal region. The color is rendered deeper, too, by the darker tips to many of the hairs. Beneath, the colors are more grayish, and the whole lining and edges of the cheek pouches, with the throat and chin, are whitish, instead of showing a good deal of chestnut. The inequality in the position and length of the digits is much greater; thus, in the St. Louis animal, the 2d finger is not much shorter than the fourth, though its claw is much smaller; in this the claw, even of the second finger, reaches but little beyond the end of the fourth finger. The greatest differences are, however, discernible in the skulls. In the present species they are broader in proportion; especially behind, and the widest portion of the zygomatic arch, instead of being at the end of the zygomatic process of the upper maxillary, with the zygomata converging in straight lines behind this point, is really considerably further back, owing to the greater extension laterally of the zygomatic process of the temporal with the convex outlines of the zygomatic arch. The forehead is much flatter and the snout shorter. The teeth are also different; the isthmus between the lobes of the anterior upper molars, instead of connecting the middle of these lobes, passes inside of the middle, exhibiting a shorter sinus inside than out. The posterior upper molar is more rounded or nearly circular with the angles obsolete. The molars of the lower jaw are much larger, especially the anterior one. The coronoid process stands a good deal higher and its axis more vertical.

The skull of the present species resembles quite closely the one figured by Waterhouse in Charlesworth's Magazine as *Geomys umbrinus*.

The absolute determination of the species of *Geomys*, as of many other American animals, is a matter of much uncertainty, in consequence of their wide range, and the difficulty of getting enough materials for satisfactory comparison. Since the article on *G. breviceps* was written, I have had the opportunity of examining several other specimens, probably referrible to this species, from quite remote localities. One of these, from western Texas, Llano Estacado, collected by Captain Pope, is quite similar in every external character, but the teeth are narrower,

and the fore claws considerably shorter in proportion. The fur is whiter beneath. One from Fort Chadbourne, Texas, again, has very large incisors and large claws. The fur is much brighter and more lustrous than in any other I have seen, and the blackish tips to the hairs impart cloudings of blackish to the shining chestnut of the back. The under parts are pale whitish cinnamon; the chin is white. The tail is unusually short.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.											
					Nose to eye.	Nose to ear.	Nose to tail.	Tail to end of vert.	Fore foot, length.	Hind foot, length.	Fore claw, length.	Fore claw, height.	Skull, length.	Skull, width.	Width of muzzle.	Width of incisors.
156	1138	Prairie Mer Rouge, La.	Jas. Fairle	Skin		6.75	2.20	1.13	.97	.50		1.55	1.00	.35	.18	
157	1139	do.	do.	do.		5.60	1.95	1.00	.95	.50	.13	1.48	.93	.36	.18	
2630		do.	do.	In alc.	.90	1.42		1.75	1.20	1.08	.56	.15			.19	
? 1652		Fort Chadbourne, Tex.	Dr. E. Swift.	Skin												
? 1736		Llano Estacado, Texas.	Capt. J. Pope.	do.		6.12	1.10		1.15	.63	.18				.20	
? 2950		Fort Riley, K. T.	Dr. W. A. Hammond.	do.												

GEOMYS PINETIS, Rafinesque.

Salamander.

Geomys pinetis, RAFINESQUE, Am. Month. Mag. II, 1817, 45. (Pine woods of Georgia.)

BRANTS, Muizen, 1827, 173.

Geomys pineti, LECONTE, Pr. A. N. Sc. Phil. VI, Sept. 1852, 159.

Saccophorus pineti, FISCHER, Synopsis, 1829, 305.

Pseudostoma floridana, AUD. & BACH. N. Am. Quad. III, 1853, 242; pl. cl, fig. 1.

? *Mus tuzu*, ORD, Guthrie's Geography, 2d Am. Ed. II, 1815, 292.

The Hamster of Georgia, MITCHELL, Medical Repository, V, 1802, 89.—IB. Bewick's Quadrupeds, 1st Am. ed. 1804, 525.

SP. CH.—Upper incisors with a single deep groove placed external to the central line, dividing the surface into two unequal portions, the inner considerably the larger. Fore feet rather longer than the hinder ones. The second claw of the hand extending nearly as far as the fourth. Cheek pouches ample. Tail naked nearly to the base. Color above, plumbeous brown, tinged with yellowish brown on the sides, and grayish beneath.

Color yellowish brown in the adult; young plumbeous? In the young a slight additional groove near the outer edge of the incisors?

This species is of large size and readily distinguished from any other found east of the Mississippi river by the single groove of the upper incisors. This groove is not central, as in the species from western Texas, but is situated wholly in the exterior half of each incisor; the inner plane portion being therefore wider than the outer, which is entirely rounded. The external ears are very rudimentary, consisting merely of a thickened ridge of skin. The tail is, in the stuffed specimen, about one-fourth the length of the body; as prepared, it at first sight appears entirely naked; a closer examination with a lens reveals, however, a few scattered hairs. The hand, as far as can be determined from its cramped condition, is a little longer than the hind foot; the claws are very long, stout, and much curved. The middle claw, measured above, is as long as the palm without the tubercle; measured below, it is contained about two and a half times in the total length. The second and fourth fingers are nearly equal;

the claw of the fourth is, however, much stouter and rather longer, projecting a short distance beyond the second. The fifth claw reaches considerably beyond the base of the fourth, or the end of its digit; and the first bears about the same relation to the fifth. The hind feet are broad; the first and second toes longer than the fifth and fourth, respectively.

The cheek pouches are very large and ample.

The upper parts are a dark brown, verging to plumbeous, this covering the central region of the back; on the sides the color is of dusky yellowish brown, extending anteriorly over the cheek pouches and outside of the legs; beneath, ashy white; showing, however, much of the plumbeous basal portion of the hair. The posterior edge of the fore legs, the chin and throat are a purer white, which color is also seen in obscure patches between the legs. The auricular region is not conspicuously more dusky. The hairs are rather stiff and very glossy above.

The only opportunity I have had of examining this species was in the hall of the Academy of Natural Sciences; the specimen was collected in Florida by Dr. Blanding, and is one of those referred to by Dr. Leconte. I am unable to say whether it ever assumes a more reddish brown tint than that described.

Measurements.

	Florida.	
	Inches.	Lines.
Nose to eye.....	1	4
ear.....	2	1
root of tail.....	10	3
Tail, from root to end of vertebræ.....	2	6 +
Arm; fore foot to end of claws.....	1	8
longest claw.....		9
its digit.....		
second claw.....		5 $\frac{3}{4}$
its finger.....		1 $\frac{1}{2}$
Leg; hind foot, from heel to end of claws.....	1	6
longest claw.....		3 $\frac{1}{2}$
Hand, without claws.....	1	
Third finger, without claw.....		4 $\frac{1}{3}$

The first mention I can find made of this animal is under the name of Hamster of Georgia, as quoted above; the descriptions appear to be by Dr. S. L. Mitchill, and are quite minute and exact, especially that in Bewick's Quadrupeds, though nothing is said about the furrows of the teeth. Other authors refer to it from time to time; but the first scientific name applied to the species was that of Rafinesque. This Audubon and Bachman completely ignore in describing the species as new under the name of *Pseudostoma floridanum*. Dr. Leconte, however, in his sketch of the genus, again restores the name of Rafinesque.

The geographical distribution of this animal is not well ascertained. If there be but one species in the southeastern States, then it is known to occur in northern Florida, and in Georgia to the Savannah river, and west to the mountains; it also occurs in Alabama.

Since the preceding description was written, several specimens have been received from Georgia and Florida, agreeing in the main with the preceding description. The large outer groove is very shallow; its deepest part in the exterior half. Most of the inner half of the surface is plane, with a faint though perfectly appreciable groove near the inner edge. In Missouri specimens the groove is narrower, deeper, more central, and with the plane portion of the inner surface much less. The tail is perfectly naked nearly to the base. I have no means of referring to the specimen of the Academy just now, and cannot say whether a fine groove may not have been overlooked. I shall, however, for the present, range these specimens under *G. pinetis*. The case is the same with the specimen in alcohol from Jacksonville. In all these the inner groove is distinctly visible, but the inner plane portion of the plane surface of the upper incisor is greater than in Missouri specimens. These are all light reddish brown, lighter than in Missouri specimens; one in alcohol has the tail flesh colored; the skin very loose.

A small skin (1500) from Florida is much smaller, and plumbago colored. The large groove is more central, and the general appearance more that of *G. breviceps*. The tail is thinly coated with scattered hairs. It is quite possible that there may be two species in Florida and Georgia, but I am inclined to believe that young specimens of the *G. pinetis* have the small inner groove of the upper incisor, and that this, with increasing age, becomes more shallow and obsolete, until finally it disappears entirely, leaving the large groove more external than in those Texan and Mexican species having one large median groove. The color, too, seems to vary from lead color to reddish with the age of the animal, as in the other species.

Should there be two species, the name *G. pinetis* may be retained for the one with two grooves on the upper incisors, while that with but one may be called *G. floridana*. There is no question of the difference of the former from *G. bursarius*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.										
					Nose to ear.	Nose to eye.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Fore foot, length.	Hind foot, length.	Fore claw, length.	Hind claw length.	Fore claw, height.	Width of incisors.
1442		Columbus, Ga.....	Dr. William Gesner....	Mounted ..	.....	.....	.....	7.50	2.70	1.45	1.28	.70	.24	.16	.....
2253	3116	Augusta, Ga.....	Dr. E. W. Harker.....	Skin .....	.....	.....	.....	8.80	2.80	.....	1.24	.....	.20	.15	.....
2629		Jacksonville, Fla.	Dr. A. J. Baldwin.....	Alcohol....	.....	.87	1.76	4.30	2.56	1.10	1.17	.....	.....	.....	.....
1500		Florida.....	Mr. Burgwyn.....	Skin .....	.....	.....	.....	5.30	1.87	.....	1.15	.42	.12	.14	.12
2822		Columbus, Ga.....	Dr. W. Gesner.....	Alcohol....	1.92	1.10	2.15	5.35	2.55	1.38	1.29	.65	.22	.....	.20

GEOMYS CLARKII, Baird.

Pecos Gopher.

Geomys clarkii, BAIRD, Pr. A. N. Sc. Ph. VII, April, 1855, 332.

SP. CH.—Upper incisors with a single deep groove bisecting the surface, the portions on either side similar. Fore feet nearly equal to or rather shorter than the hinder ones. Second claw of the hand reaching as far as the fourth. Pouches small. Fur soft and full.

Color above, uniform yellowish brown, the hairs with dusky tips. Beneath, paler and grayer. Check pouches much like the surrounding region.

This species is not of large size, compared with some others with deep grooves in the incisors. The incisors are broad; the upper ones with a single deep broad groove, with rounded edges down their very centre, the portions at either side being of the same width and nearly symmetrical. The form is stout and the skull very broad and massive. The cheek pouches, as shown in the dried skins, are unusually small at their mouth, although extending pretty deep. These are well lined with hair throughout. The external ears are very rudimentary, consisting merely of a thickened ridge encircling the aperture, without any distinct flap. The whiskers are moderately long, whitish, with a few black ones intermixed. The tail, which is contained from two to two and a half times in the body, is covered rather thinly with stiff longish hairs, which are far enough apart to show an indistinct verticillation of scales on the skin; the hairs are more crowded towards the tip. The tail cannot, however, be called naked, although more sparsely covered than in the *G. bursarius*.

The feet are very large; the hands when straightened out are about equal to the feet proper. The middle claw as measured above, when applied to the palm, reaches from the end of the third finger to the base of the tubercle. Measured below, it is contained not quite two and a half times in the total length. The 2d and 4th fingers, with their claws, are almost exactly equal in length, both fingers and claws respectively, although the fourth claw is stoutest. The 5th claw reaches nearly to the end of the 4th finger, (exclusive of claw,) the first to that of the 5th finger. The ball of the wrist is very large, and bordered behind by an oblique fringe of stiff hairs, the same also margining the fingers. The claws are very long, curved, compressed and acuminate towards the tip beneath. The hind feet are broad; the claws small, the first and second spoon-shaped, and respectively larger and reaching further than the fourth and fifth.

The fur is everywhere remarkably soft and full, with a good deal of lustre, with little or none of the stiffness and harshness of some other species. The whole upper surface of the head and back is a rather light and dull yellowish brown, the tips of the hairs being finely dark brown or black, slightly clouding the ground color. This yellowish tint extends about half way down the sides, with little of the clouding, however, and then begins a purer paler tint of straw yellowish brown, darker anteriorly. The hairs are everywhere dull plumbeous at the base, which is shown a good deal on the sides where the fur is thin. The inside of the pouches is much like the anterior portion of the under surface without any indication of patches of color. The sparsely haired feet and tail are yellowish brown, somewhat plumbeous along the toes and near the tip of the tail.

A specimen of this species collected in western Texas by Dr. Kennerly, in July, between the Pecos and Red rivers, agrees in all essential points, though the colors above are a little darker.

Detailed measurements.

	No. 6.		No. 447.	
	Inches	Lines.	Inches.	Lines.
Nose to eye.....			1	
ear.....			1	8
root of tail.....	6	6	6	
Tail, from root to end of vertebræ.....	2	6	2	5
portion covered with short hair.....	2	2	2	
Ears, width.....		2		2½
Arm; forefoot to end of claws.....	1	3½	1	3
longest claw.....		7		6
hand, without claw.....		10½		9½
third finger, without claw.....		4		3
second claw.....		5		4½
its finger.....		2		2
Leg; hind foot from heel to end of claws.....	1	3½	1	3
longest claw.....		3½		3

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.										Collected by—	
							Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of fore claw.	Length of hind claw	Length of skull.	Width of skull.	Width of muzzle.		Width of incisors.
6 1624	Presidio del Norte.	.....	Maj. W. H. Emory	....	Skin	....	6.80	2.50	....	1.30	1.30	.58	.29	1.93	1.27	.39	.23	J. H. Clark.....
.... 1623	do.....	.....	.....do.....	....	Skull	....	.....	.....	.....	.....	.....	.....	.....	2.30	.....	.44	.30	do.....
447 1581	Pecos river, Texas	.....	Lt. A. W. Whipple	....	Mounted	....	6.00	2.00	....	1.25	1.26	.50	.25	.....	.....	.....	.....	Dr. C. B. Kennerly.
1737	do.....	.....	July 14, 1856	Capt. J. Pope	205	Skin	8.50	3.00	3.20	....	1.35	.56	.25	.....	.....	.....	.22	.....

GEOMYS CASTANOPS.

Chestnut-faced Gopher.

Pseudostoma castanops, BAIRD, in Rep. Stansbury's Exped. G. S. Lake, June, 1852, 313. (Bent's Fort.)

AUD. and BACH. N. Am. Quad. III, 1854, 304.

Geomys castanops, LECONTE, Pr. A. N. Sc. Phil. VI, Sept., 1852, 163.

SP. CH.—Upper incisor with a single deep groove bisecting the surface, the portions on either side similar. Fore feet shorter than the hinder. Second claw extending as far as the fourth. Check pouches small. Color, pale brownish yellow; the fore part of head and sides of neck yellowish chestnut, sharply defined. Pouches whitish.

This species in general appearance resembles the *G. clarkii*, from western Texas. The upper incisors are furrowed exactly down the central line by a rather deep broad groove, rounded off at the sides as well as the bottom, separating portions; on either side, which are almost per-

fectly symmetrical in size and shape. The external ears are entirely obsolete, with scarcely a thickened ridge of skin to represent the auricle. The tail is contained not quite three times in the body; it is moderately clothed with stiff appressed hairs of a dusky color.

The fur is quite sparse though moderately soft everywhere. The cheek pouches are small and not very capacious; scantily haired within.

The fore feet are decidedly shorter than the hinder ones; its claws are moderately large and stout, acuminate near the tips. The third claw, as measured above, does not reach nearly from the end of its digit to the tubercle on the palm; below, it is scarcely one-third the total length of the hand. From the heel to the end of the first claw is about two-fifths of the whole hand. The second and fourth fingers and claws are of the same length, or the second finger is even the longer; the fourth claw, as usual, is, however, the stouter. The first claw does not quite reach the end of the fifth finger; the fifth claw barely to the end of the fourth finger. On the hind foot the toes are cleft quite deeply; the first is longer than the fifth (the claw of the latter reaching to the middle of the claw of the former); the second claw reaches nearly to the end of the third, and is even the longer, besides being very broad and spoon-shaped; the fourth claw reaches to the end of the second toe.

The upper parts and sides, generally, are of a pale brownish yellow; the hairs on the back and thighs slightly tipped with darker yellowish brown, so as to impart a faint shade of this color; the sides and under parts are rather paler, showing a good deal of the dark plumbeous bases to the hairs. The top, anteriorly, and the sides of the head, are of a pale yellowish chestnut; this color extending behind the ears in a symmetrical subcircular patch, having the ear as a centre, and a radius of about three-quarters of an inch. These patches are distinctly and sharply defined; the two on opposite sides separated by a narrow strait, colored like the back. The chin, pouches, and throat are somewhat of the same color, with a few dusky hairs. The region immediately around the ears is rather dusky.

The only specimen of this species, at present known to naturalists, is the one in the Patent Office, which served as the basis of my description in Captain Stansbury's report. It was collected by Lieut. James W. Abert, United States army, and is labelled as having been obtained on the prairie road to Bent's Fort, New Mexico.

General dimensions.	Inches.	Lines.
Nose to eye.....	1	$\frac{1}{2}$
ear	1	7
root of tail?.....	7	3
Tail	2	2
Ears, width.....		2
Arm; fore foot to end of claws	1	4
longest claw.....		6
hand, without claw		10 $\frac{1}{2}$
third finger, without claw.....		3 $\frac{3}{4}$
second claw		4 $\frac{1}{2}$
its finger		2 $\frac{1}{2}$
Leg; hind foot, from heel to end of claws.....	1	5 $\frac{1}{3}$
longest claw.....		3

The only species with incisors, similarly grooved, to which this approaches at all, is the *G. clarkii*, of Western Texas. The differences in color are at once appreciable; the former having the well-defined patch on each side of the face; the latter colored uniformly over the whole back and sides. The claws of the hands are shorter, and the fingers longer, in *G. castanops*; its hind feet are longer in proportion to the hands, and the second toe longer, its claw larger and more spoon-shaped. The skull is not so broad, nor is the expansion of the zygomatic arch at the junction of the maxillary process and the malar bone, so great.

GEOMYS HISPIDUS, Leconte.

Geomys hispidus, LECONTE, Pr. A. N. Sc. Phil. VI, Sept., 1852, 158. (Mexico.)

Pseudostoma (Geomys) hispidum, AUD. & BACH. N. Am. Quad. III, 1854, 306, (from Leconte.)

SP. CH.—Upper incisor probably with a single median furrow; fore feet decidedly shorter than the hinder; second claw of hand reaches nearly as far as the fourth; cheek pouches small; fur very stiff and coarse; color, everywhere a uniform reddish brown or dark chestnut; the hairs the same color to their roots.

This species, established by Dr. Leconte, is, as stated by him, quite conspicuous among all others by the great coarseness of the hair and its uniform color throughout. The hairs, in fact, are quite like bristles, and scattered thinly over the skin, with little or no softer fur intermingled. The ears are, as usual, very rudimentary. The upper incisors are broken off, but a careful examination of their stumps in the sockets shows them to have been broadly and deeply grooved down the central line; there was probably no second internal groove. The pouches do not appear to have been very ample.

The forefeet are rather shorter than the hinder ones; the middle claw measured above is about as large as the hand to the tubercle, (the claw not included,) its under surface is contained nearly three times in the whole hand. The second and fourth fingers are nearly equal; the fourth claw rather longer, and decidedly stouter than the second. The fifth claw does not reach to the end of the fourth finger, (the claw excluded.) On the hind foot the disproportion between the first and fifth toes, and the second and fourth toes, is greater than usual; the first claw reaching even more than midway between the fourth and fifth, or even to the base of the former; the second again but little shorter or smaller than the third. The hand of this species is very similar in general appearance to that of *Thomomys douglassii*. The tail of the specimen, as prepared, is entirely naked.

The color above and below is a nearly uniform reddish brown or dull chestnut, the hairs being of the same tint to their very roots.

The only specimen I have seen of this species is in the rich cabinet of the Philadelphia Academy of Natural Sciences. It was collected by Mr. Pease, between Vera Cruz and the city of Mexico, during the late war, and is the original of Dr. Leconte's description.

Measurements.

	Inches.	Lines.
Nose to root of tail (very uncertain)-----	10	6
Tail from root to end of vertebræ -----	3	-----
Arm, forefoot to end of claws-----	1	9
longest claw, (3d)-----		8½
its digits-----		5½
Hand, without claw-----	1	½
Second claw -----		6
its finger above-----		3

GEOMYS MEXICANUS.

Tucan.

Ascomys mexicanus, (LICHT.) BRANTS, Muizen, 1827, 27.

LICHT. Abh. K. Akad. Wiss. 1827, 113.

WAGNER, Suppl. Schreb. III, 1843, 384.—Is. in Schreber IV; pl. ccvi, A (interpolated).

CHARLESWORTH, Pr. Zool. Soc. Lond. IX, 1841, 60.

Saccophorus mexicanus, FISCHER, Syn. 1829, 305.

EYDOUX and GERVAIS, Guerin Mag. de Zool. VI, 1836, 23; pl. xxi, f. 5, 6.

EYDOUX and GERVAIS, Voyage de la Favorite, V, 1839, 23; pl. viii, f. 5, 6. (Skull.)

Geomys mexicanus, LECONTE, Pr. A. N. Sc. Ph. VI, Sept., 1852, 160.

Pseudostoma (Geomys) mexicanus, AUD. and BACH. N. Am. Quad. III, 1854, 309.

Tucan, HERNANDEZ.

SP. CH.—“Fur very fine, shining, very dark cinereous, above tipped with black, beneath entirely cinereous; nose and whiskers brownish; breast and fore legs slightly tinted with brown. Ears short. Upper incisors with a very deep groove on the middle of the anterior surface. Feet thinly clothed with brownish hair. Tail covered with hair, which is very dense and long at the base, gradually becoming shorter and more scanty, leaving the tip almost naked.”

The preceding diagnosis is by Dr. Leconte, from a specimen in the collection of the Philadelphia Academy.¹ The length is given at 11 inches; tail 5; fore foot to end of middle claw 1.7 inch; hind foot to end of middle claw 1.7 inch.

This completes the record of American animals of the genus *Geomys*, with the exception, perhaps of the *Saccophorus quachil*, of J. E. Gray, Pr. Zool. Soc. XI, 1841, 79, from Coban, Central America. As no description accompanies the name, we can only learn that the genus extends this far to the south.

¹ As this article is passing through the press, I find (too late for use) a specimen of this species in the collection of the National Institute, brought from Mexico by Baron Gerolt. It is much larger than any skin of the genus I have ever seen.

THOMOMYS, Maxim.

Thomomys, PRINCE MAXIM. Nova Acta Acad. C. L. XIX, 1. 1839, 383.

BRANDT, Beit. Kennt. Säugt. Russlands, 1855.

Oryzomys, EYDOUX and GERVAIS, (in part,) Mag. de Zool. VI, 1836, 23.—*Id.* Voy. de la Favorite, v, 1839.

Anterior face of upper incisors plane or slightly convex, and with a fine groove along the inner margin, sometimes obsolete; no groove in the centre. Skull not very massive; zygomata slender. Anterior upper molars with two somewhat divaricated lobes, the anterior considerably smaller and sub-circular. The two middle molars narrowly and transversely ovate, the acute pointed end outside. Posterior lower molar nearly circular. Fore feet considerably shorter than the hinder ones, comparatively small and weak, with the claws not much developed, though considerably larger than the hinder ones. Second finger and claw nearly equal to the fourth. Cheek pouches moderately large.

The description of the osteology of *Geomys* will answer very well for that of *Thomomys*. The principal differences are seen in the nearly smooth anterior faces of the upper incisors, which have merely a very fine groove along the inner margin and the ovate crowns of the molars, which in *Geomys* are truly elliptical.

For the present I leave the species of *Thomomys* without any attempt to subdivide them, or to exhibit their characteristics in a brief synopsis. All the species of the family vary exceedingly as to color and proportions, especially when these are based on the dried skin. This is exceedingly extensible, and may thus convey the idea of a comparatively short tail, when, in reality, in nearly or quite all the species, the tail is not much less than half the length of the body. The size of the claws and teeth vary; the color of the immature, though full grown animal, differs from the adult, and, as already stated, the exact proportions can only be ascertained from fresh specimens, or those preserved in alcohol. The descriptions in the following pages were all made two years ago, and although, with the additional specimens received, a careful revision of the whole subject might have furnished more satisfactory results, yet the time allotted for the completion of the present report will not admit of the necessary delay. I am, however, well satisfied that I have not materially overstated the number of species described, as whatever may be the variations of single specimens from the type, there is an appreciable difference in the series, even though it be difficult of intelligible expression.

The species to be described are as follows:

1. *Thomomys bulbivorus*.—Coast of California, from Tejon Pass to some distance north of San Francisco.
2. *Thomomys laticeps*.—Coast of northern California, (Humboldt Bay.)
3. *Thomomys douglassii*.—Lower valley of the Columbia River, and Puget's Sound.
4. ? *Thomomys borealis*.—Upper valleys of the Columbia, towards Rocky Mountains; probably at higher elevations than *T. douglassii*.
5. *Thomomys rufescens*.—Upper Missouri and Saskatchewan.
6. *Thomomys talpoides*.—Shores of Hudson's Bay.
7. *Thomomys umbrinus*.—Western Texas and New Mexico, along eastern slope of Rocky Mountains, and along the mountains into Sonora.
8. *Thomomys fulvus*.—Valley of the Colorado and tributaries, from the San Francisco mountains to Fort Yuma, and across to San Diego.

Of these I am inclined to believe that *Thomomys borealis* may hereafter be referred either to *T. douglassi* or to *T. rufescens*. What other combinations may be required can only be ascertained hereafter.

THOMOMYS BULBIVORUS.

California Gopher.

? *Diplostoma bulbivorum*, RICH. F. B. Am. I, 1829, 206; pl. xviii, B. (marked *Diplostoma douglassi*.)—IB. Zool. of Blossom, 1839, 13.

Geomys bulbivorus, LECONTE, Pr. A. N. Sc. Phil. VI, 1852, 163.

Pseudostoma bulbivorum, AUD. & BACH. N. A. Quad. III, 1854, 337.

Diplostoma douglassi, RICH. F. B. A. I, 1829, pl. xvii, B. (by error.)

Oryctomys (Saccophorus) bottae, EYDOUX ET GERVAIS, Mag. de Zool. VI, 1836, 23; pl. xxi, fig. 4, (molars).—IB.

Voyage de la Favorite, V, 1839, 23; pl. viii, f. 4, (molars.)

Thomomys bottae, LESSON, NOUV. MAN. R. AN. 1842, 119.

BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.

Sr. CH.—Cheek pouches large, completely furred inside, white to their very margin, which is dark brown, forming a very strong contrast. Tail from one-third to less than one-half the length of body; slender at base. Upper incisors quite convex transversely; groove obsolete. Hands small; claws very slender and delicate, nearly straight; middle claw $4\frac{1}{2}$ lines, its under surface occupying about two-sixths the whole hand, its finger barely shorter than this; claw of thumb extending over two-fifths of whole hand.

Color.—Reddish chestnut brown above and on sides, finely lined everywhere by dusky tips to the hairs, without any uniform dark wash on the back. Beneath paler. Tail grayish white, except a short line of dusky along the base above. Chin dusky; its extremity white.

This species, although apparently the largest of its genus, does not appear to attain the size of *Geomys bursarius*, as the skull of a stretched skin nine inches long presented the appearance of extreme old age, in a distinct median longitudinal crest on the top of the head. The incisors are yellow; the upper ones slightly convex transversely, with an obsolete furrow near the inner edge, the extreme edge being slightly raised into a ridge. The whiskers are short, and silver gray; the ears, though short, are distinctly discernible, having an elevation of nearly a line. The body is cylindrical, or somewhat depressed; the fur very soft, and rather short on the middle of the back, not exceeding four lines in length. The feet are quite small, and weaker than usual in this section. On the hand the third finger is longest; its claw, measured from beneath, occupies about one-third the entire length of the palm, and is a little longer than the toe itself, which, in turn, is nearly one-third the same length; the second and fourth claws reach nearly the same length, the former a little the longer, extending beyond the middle of the third claw; the claw of the fifth finger extends to the bulb of the fourth; the first finger is very short, its claw not reaching to the end of the fifth finger, nor quite to the base of the third, extending over about two-fifths of the palm. The palms are naked, and the fingers are all margined by a fringe of stiff gray hairs. The claws are all long, compressed, and slightly curved; not acuminate at the end. The claws of the hind feet, as usual, are much shorter than those in front, broader and more spoon-shaped. The third toe is longest, the second little shorter, and longer than the fourth; the first exceeding the base of the second toe and longer than the fifth. The soles are naked. The tail is moderately long; about one-third the total length, covered throughout with close pressed hairs. The cheek pouches, too, are densely coated with short hairs, which do not exhibit the naked skin between.

The upper parts and sides are of a rich chestnut brown, or dark cinnamon, finely and faintly

lined with black, not appreciably darker on the middle of the back; the hairs are dark lustrous lead color at base, reddish brown near the end, and tipped with dark brown or black. The under parts generally are of a rather lighter tint of reddish brown, without the dark tips of the hairs, which are, however, lead colored at the base. There is a dusky suffusion around and behind the ear; the region about the mouth, the chin, and the region along the inner margin of the pouches, are of a similar dark ashy brown, or black; the inside of the cheek pouches is clear white, forming a marked contrast to the surrounding color. The feet and tail are grayish white, the colors of the back running out on the upper surface of the latter to beyond its middle.

Detailed measurements.

	604. ¹		603. ¹		605. ¹		613. ²	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to occiput, about.....	1	10	1	.9	-----	-----	1	7
eye.....	-----	10	-----	-----	-----	-----	-----	9
ear.....	1	7	-----	-----	-----	-----	1	3
root of tail.....	7	6	6	9	6	-----	6	2
end of outstretched hind legs.....	-----	-----	-----	-----	-----	-----	7	11
Tail, from root to end of vertebræ.....	2	6	2	6	2	3	3	1
hairs.....	-----	-----	2	8	2	5	3	2
uncovered portion.....	2	-----	2	4	1	9	-----	-----
Ears, height posteriorly.....	-----	-----	-----	-----	-----	-----	-----	4
height anteriorly.....	-----	-----	-----	-----	-----	-----	-----	3
height internally above skull.....	-----	1½	-----	¾	-----	1	-----	4
width.....	-----	3	-----	3	-----	-----	-----	4
Arm, between claws across shoulder.....	-----	-----	-----	-----	-----	-----	5	6
length of fore arm.....	-----	-----	-----	-----	-----	-----	-----	10
from elbow to end of claws.....	-----	-----	-----	-----	-----	-----	2	4
fore foot to end of claws.....	-----	11	-----	10¾	-----	-----	1	-----
longest claw.....	-----	4½	-----	4½	-----	4	-----	4
longest toe and claw.....	-----	6¾	-----	6¾	-----	-----	-----	-----
Leg, from knee joint to end of claws.....	-----	-----	-----	-----	-----	-----	2	5
tibia.....	-----	-----	-----	-----	-----	-----	-----	6
hind foot from heel to end of claws.....	1	2	1	2	1	-----	1	6
longest claw.....	-----	2	-----	1¾	-----	-----	-----	3

¹ Skins.

² Entire in alcohol.

It is this species that is so well known, under the name of "Gopher," to the California farmer and horticulturist as a destroyer of the products of the farm and garden, and against which, in conjunction with the ground squirrel, (*Spermophilus beecheyi*.) such a variety of traps and poisons is prepared and announced, each more infallible than its predecessor. Preparations of phosphorus and strychnine appear to be most effective.

I very little doubt that in this species is to be found the long lost and very little known *Diplostoma bulbivorum* of Richardson, described from a specimen in the museum of the Hudson

Bay Company, supposed to have come from the banks of the Columbia. The description of the mouth and adjacent parts represents very accurately the characters of the group, as may be seen by comparing it with the account I give under the head of *Geomys*, and without a single statement that is not well founded in fact. The colors of the fur, the contrast of the white cheek pouches and chin with the liver brown under the lower jaw, are very accurately indicated, and, indeed, as a description of the California gopher, there is little wanting. The feet and tail are almost precisely the same. The only discrepancy is in the size of the skin, which is given at eleven inches; but a large California gopher would readily stretch to this extent, and all the more stable measurements agree very well. In the Smithsonian collections are overstuffed skins measuring over nine inches to the root of the tail, which could readily have been extended to eleven.

The following are the principal measurements of the skin described by Richardson, compared with specimen No. 613, from California, entire in alcohol:

	D. bulbivorum.	No. 613.
	<i>Inches.</i>	<i>Inches.</i>
Length of head and body.....	11. 00	6. 10
head alone	3. 00	1. 60
tail	2. 50	3. 08
fore foot from heel	1. 00	1. 00
longest claw.....	. 36	. 33
hind foot from heel.....	1. 50	1. 50
longest claw.....	. 17	. 25

These measurements, it will be seen, agree very closely in all essential features except the length, and the disproportion between these is too great not to render it certain that the specimen described by Richardson was excessively overstretched.

The next description of this species was by Eydoux and Gervais, in 1836, from a specimen collected at Monterey. Dr. Leconte is in error in referring their animal to the *Thomomys rufescens* of Maximilian, which is widely different.

The reason that Richardson failed to recognize the close affinity that really exists between his *Diplostoma bulbivorum* and *Geomys douglassii* lies in the fact that he supposed the cheek pouches of the latter to be naturally pendulous from the head, as when inverted in the specimen before him. The distortion or contraction of the mouth, too, prevented his noticing the peculiarities so evident in the skin of *Diplostoma*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.												
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Fore foot, length.	Hind foot, length.	Fore claw, length.	Skull, length.	Skull, width.	Width of muzzle.	Width of incisors.
2475	.....	.....	Tejon Valley, Cal ¹ .	Lt. R. S. Williamson	2	Mounted.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2476	.....	.....	do.	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
613	1759	.....	Monterey, Cal.	Lt. W. P. Trowbridge	.....	Skin	.....	.....	1.60	6.10	3.08	...	1.00	1.50	.33	1.74	.96	.29	...
366	1280	.....	do.	do.	.....	Mounted	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.80	1.07	.29	.19
367	1281	.....	do.	do.	.....	do.	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	.90	.28	.14
~~2639~~	.....	.....	do.	A. S. Taylor	.....	In alc.	.86	1.52	.....	.....	2.80	.....	.....	.....	.35	.....	.....	.....	.....
2647	.....	.....	do.	do.	.....	do.	.....	.....	.....	.....	2.88	.....	1.00	1.14	.....	.....	.....	.....	.....
2648	.....	.....	do.	do.	.....	do.	.87	1.50	1.70	5.70	2.27	.....	.80	1.00	.....	.....	.....	.....	.....
.....	938	.....	do.	William Hutton	.....	Skull	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.58	.89	.30	.18
2649	.....	.....	San Jose, Cal.	A. J. Grayson	.....	In alc.	.90	1.52	2.05	5.85	2.70	.....	1.13	1.20	.36	.....	.....	.....	.....
2650	.....	.....	do.	do.	.....	do.	.85	1.50	1.90	5.46	2.50	.....	.95	1.04	.30	.....	.....	.....	.....
604	.....	.....	San Francisco, Cal.	R. D. Cutts	.....	Skin	.....	.....	1.84	7.50	2.10	.....	1.00	1.16	.42	.....	.....	.....	.....
603	1757	.....	do.	do.	.....	do.	.....	.....	1.75	6.75	2.50	2.67	.90	1.10	.37	.....	.....	.32	.20
605	.....	.....	do.	do.	.....	do.	.....	.....	.....	6.00	2.15	.....	.....	.97	.31	.....	.....	.....	.....
2646	.....	.....	do.	Lt. W. P. Trowbridge	.....	In alc.	.85	1.35	1.80	5.41	2.30	.....	.90	1.05	.26	.....	.....	.....	.....
2640	.....	.....	Petaluma, Cal.	E. Samuels	.....	do.	.85	1.36	1.55	4.60	2.50	.....	.....	1.20	.30	.....	.....	.....	.....
2641	.....	○	do.	do.	.....	do.	.45	1.05	1.23	3.90	1.20	.....	.70	.80	.20	.....	.....	.....	.....

¹ Collected by Dr. Heermann.

THOMOMYS LATICEPS, Baird.

Broad-headed Gopher.

Thomomys laticeps, BAIRD, Pr. A. N. Sc. Phil. VII, April, 1855, 335. (Humboldt Bay.)

SP. CH.—Cheek pouches moderate, well haired. Tail nearly one-half the body, thick at base. Skull very broad and muzzle short; the upper incisors convex, the groove quite distinct. Feet very large and broad. Claws of fore foot or hand small, slender, 4 lines long above; below, about two-sevenths the length of the whole hand, its digit about two-eighths. Claw of thumb extending over nearly three-sixths the hand.

COLOR.—Above, yellow reddish brown; the dorsal region with the hairs largely and sharply tipped with blackish; sides nearly uniform; beneath, tinged with reddish. Pouches dull white, the dusky of the surrounding region dipping into them. Tail grayish white, dusky above.

This species, with one from the upper Missouri, is eminently characterized among all those with smooth upper incisors by the very broad and powerful feet and larger hands. The ear flap is short though distinct; the whiskers short and of a grayish color. The fur is soft, silky, and moderately long. The tail is much developed, very thick at the base, and almost half the length of the body, well coated with hair. The pouches are not very large, densely furred inside next the head, more sparsely elsewhere.

The fore feet are large, especially the palms; the first finger or thumb is short, though inserted quite far forwards its claw does not quite reach to the middle of the hand, (from wrist to point of claw.) The claws generally are rather small, much curved, and quite slender; the third projects, on its lower edge, to a distance which is contained about three and a half times in the entire hand, or $\frac{3}{4}$ ths; its phalanges only about half the length of the palm proper. The second finger and claw are considerably longer than the fourth; the point of the fifth claw extending more than half the total length of the hand; the first claw extending as far as the

base of the fifth or a little beyond. Hind feet broad and powerful; the claws thick and stout; the third reaching furthest; the first longer than the fifth, and the second than the fourth.

The incisors are light yellow; quite convex anteriorly; the inner furrow obsolete, though present; all the incisors unusually thick and stout.

The ground color of the back and sides, and beneath, is a yellowish brown, tending to reddish between the fore legs; the hairs on the back and top of the head are, however, largely tipped with black, less conspicuously on the sides, although this mottling extends to the edge of the belly; the hairs are distinctly yellowish brown within the black tips, and everywhere have lead colored bases. The throat, edges of the cheek pouches, and region about the ears, are dusky; the chin, inside of cheek pouches, and feet are grayish white. The tail is dusky above almost to the tip; elsewhere like the feet.

Measurements of 513.

	Inches.	Lines.
Nose to eye.....		8
to root of tail.....	5	2
to end of outstretched hind legs.....	6	2
Tail, from root to end of vertebræ.....	2	6
from root to end of hairs.....	2	6
uncovered portion.....	1	11
Ears, height internally above skull.....		$\frac{1}{2}$
width.....		3
Arm, fore foot to end of claws.....		11 $\frac{1}{2}$
palm.....		5 $\frac{3}{4}$
longest claw.....		4
longest toe and claw.....		6
Leg, hind foot from heel to end of claws.....	1	1
longest claw.....		2 $\frac{1}{2}$
Skull, width.....	1	1

This species presents some peculiar points of structure, readily distinguishing it from all others examined. The general color is lighter and more yellowish than any except *G. rufescens*? and the hairs on the back are broadly tipped with black. The feet and tail are very strong and stout; the hand very large in proportion to the claw, &c.

The skull is of unusual breadth, and the muzzle, with the nasal bones, very short; in these respects very different from *T. bulbivorus*. The hands and feet are larger, while the fore claws are of much the same size. The tail considerably longer and stouter. The palms and fingers are also larger, but the claws much smaller than in the *Steilacoom* species.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
513	1648	Humboldt Bay.....	Lt. W. P. Trowbridge, U. S. A..	Skin.....

THOMOMYS DOUGLASSII.

Coia Go pher.

Geomys douglassii, RICH. F. BOR. AM. I, 1829, 200; pl. xviii, C, fig. 1-6. (Skull.)—IB. Zool. of Blossom, 1839, 120.

LECONTE, PR. A. N. SC. PHIL. VI, 1852, 162.

Ascomys douglassii, WAGNER, Suppl. Schreb. III, 1843, 392.

Pseudostoma douglassii, AUD. & BACH. N. AM. QUAD. III, 1853, 24; pl. cv.

Thomomys douglassii, GIEBEL, Säugt. 1855, 531.

Geomys fuliginosus, SCHINZ, Synop. Mamm. II, 1845, 36.

SP. CH.—Cheek pouches large; sparsely haired on the outer wall. Tail, one third to nearly one half the body. Upper incisors nearly plane in front, with a distinct and sharp groove. Hand large; claws very large and stout; palm and digits very short. Middle claw $5\frac{1}{2}$ lines above; below, occupying nearly two-fifths of the hand; its toe about two-eighths. First finger or thumb very short, barely reaching over two-sixths the hand.

Color.—Above, dusky chestnut brown, but slightly mottled on sides and beneath with an ashy brown tinge. Cheek pouches whitish at the bottom, the line of demarcation indistinct, and the brownish color of the marginal region running down into the pouch. Tail grayish; dusky above.

This species has the depressed form of body, without indication of neck, &c., of the genus. The ears are quite large, being distinctly evident as a margin to the auditory aperture. The whiskers are short and white; the cheek pouches ample; scantily furred within, especially on the side opposite to the jaws. The incisors are yellow, plane in front, or only rounded at the edges; the inner edge of the upper ones with a distinctly marked and sharp though delicate groove, differing decidedly in the flatter incisors and distinctness of groove from *T. bulbivorus*. The tail is moderate, contained nearly three times in the length of the body; it is depressed and somewhat flattened at the tip, and well covered with short stiff hairs. The fur is fine, soft, and silky. The feet are large and strong; the fore feet with the claws much curved, compressed, trenchant, and long. The thumb is unusually short, almost rudimentary; the tip of its claw not extending to the fissure between the second and third, and barely to the end of the bulb of the fifth. The third claw is, as usual, the longest, and of great development; it occupies nearly two-fifths of the total length of the hand from the posterior part of the tubercle. The palm and fingers are, however, unusually short, the third claw extending beyond the bulb one-fourth longer than the length of this finger, which indeed is contained nearly four times in the total length of the hand. The second and fourth claws are about equal; the tip of the fifth does not reach quite to the end of the bulb of the fourth finger. On the hind foot the third claw extends furthest; the second is a little longer than the fourth, and the first than the fifth.

The upper parts are of a reddish or chestnut brown, not appreciably darker on the back; brightest and clearest along the occiput. On the sides and beneath, the lead colored bases of the hairs are exhibited to a considerable extent, the ends tipped with pale grayish or ashy reddish brown; anteriorly, on the throat, between the fore legs and region around the cheek pouches, the prevailing tint is a purer grayish ash. The edge of the lips and the top of the snout are dusky, but the pouches are whitish on the inside near the bottom and do not exhibit the sharp and decided contrast of white and dark brown seen in *T. bulbivorus*. The region behind the ear is dusky. The feet are dull grayish white; the tail is similar, with a dusky line along a part of the upper surface.

The fur exhibits little mottling with dusky; the sides being nearly plain, thus differing considerably from *T. bulbivorus*. The sides are more ashy and the under parts with less red.

Anteriorly the ashy tint prevails, and there is no visible patch of white as in the last; what there is of this color being confined to the bottom of the pouch instead of coming up to the edge. The tail is thicker at the base than in the last mentioned species; the claws are much stouter, larger, and more curved, but the palms themselves are decidedly shorter, with the first and fifth fingers smaller, especially the first; a similar relation exists in the hind feet, which are shorter, but the claws longer in the present species. The incisors are deeper orange, flatter anteriorly, and the groove sharper and more distinct.

Measurements.

	275.		355.		452.	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to eye.....		10½		6½		6
root of tail.....	6		4	6	3	9
Tail, from root to end of vertebrae.....	2	1	1	5	1	7
from root to end of hairs.....	2	2	1	6	1	8
uncovered portion.....	1	9	1	5	1	5
Ears, height internally above skull.....		1½		¾		
width.....		2⅔				
Arm, fore foot to end of claws.....		11½		10		8
longest claw, (above).....		5½		4½		3⅔
longest claw, with toe.....		6⅔		6		4½
Leg, hind foot from heel to end of claws.....	1	1½		11½		10
longest claw.....		2½		2		1¾
Skull, length.....			1	2	1	1½

No. 452, from Fort Dalles, is much the smallest of the three above referred to, and may possibly belong to another species. It differs in having the hair rather longer, and the under parts considerably lighter. There is no appreciable difference between the colors of the cheek pouches and the region surrounding them.

Compared with *T. umbrinus*, this species has a rather shorter tail, stouter claw, but shorter palm, &c. In distribution of coloration, the differences are as much as between it and *T. bulbivorus*.

A gopher, collected by Dr. Newberry, at Canoe creek, California, has the claws of *T. douglassii*, but the under parts are dirty white; the feet and tail clearer. This agrees somewhat with the specimens in the Philadelphia Academy, labelled *G. borealis*, and brought from Oregon by Townsend. If this be a distinct species, Dr. Newberry's specimen may probably belong to it.

No. 1962 resembles *T. bulbivorus* much more in color than *T. douglassii*. The large and much compressed fore claws, however, belong to the latter species.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.										Collected by—		
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of ver.	Fore ft., length.	Hind ft., length.	Fore claw, length.	Skull, length.	Skull, width.		Width of muzzle.	Width of incisors.
275	.....	.....	Ft. Steilacoom, W. T.	April 15, 1854	Gov. I. I. Stevens	8	.....	.....	.....	.....	6.00	2.05	.96	1.13	.47	.....	.....	.....	.....	Dr. G. Suckley..
355	1269	.....	do.....	.....	Dr. Geo. Suckley	.....	Skin	.....	.....	.....	4.50	1.42	.83	.97	.36	1.17	.....	.....	.....	.....
659	.....	.....	do.....	.....	do.....	.....	do.....	.....	.....	.....	.....	.....	.65	.90	.31	.....	.....	.....	.....	.....
1962	.....	.....	do.....	March, 1856	do.....	84	do.....	.....	.....	.....	.....	.....	.....	.....	.42	.....	.....	.....	.....	.....
5945	.....	.....	do.....	.....	do.....	.....	In alc.	.66	1.25	1.57	4.60	2.10	1.00	1.10	.35	.....	.....	.....	.....	.....
? 914	1965	.....	do.....	.....	do.....	.....	Skin	.....	.....	.....	.....	.....	.....	.....	.....	1.49	.89	.28	.20	.....
452	1586	.....	Ft. Dahe, O.T.	.....	do.....	.....	Mount'd	.....	.....	.....	3.75	1.58	.67	.83	.30	1.13	.....	.....	.....	.....
995	.....	♀	do.....	April 25, 1855	do.....	59	Skin	.....	.....	.....	5.33 ¹	1.83 ¹	.....	.83	.30	.....	.....	.....	.....	.....
? 1260	2225	♂	Canoe Creek, Cal.	August, 1855	Lieut. R. S. Wil- liamson.	.....	Mount'd	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Dr. J. S. New- berry.

¹ Measured before skinning.

THOMOMYS BOREALIS.

Geomys borealis, RICH. Report British Asso. for 1836, V, 1837, 156.—(Said here to come from Saskatchewan.)

BACHMAN, J. A. N. Sc. Phil. VIII, 1, 1839, 103.

Ascomys borealis, WAGNER, Suppl. Schreb. III, 1843, 391.*Pseudostoma borealis*, AUD. & BACH. N. Am. Quad. III, 1853, 198; pl. cxlii.*Geomys townsendii*, (RICH. MSS.) BACH. J. A. N. Sc. Phila. VIII, 1, 1839, 105.

RICH. Zool. of Blossom, 1839, 12.

Ascomys townsendii, WAGNER, Suppl. Schreber, III. 1843, 391.

After a careful examination of the specimens in the collection of the Phila. Acad. Nat. Sciences, upon which this species was established by Bachman, I have failed to find any satisfactory points of distinction from *T. douglassii*. These specimens were collected by Dr. Townsend on the Columbia river, and were named *Geomys borealis* and *townsendii* by Richardson; the latter, however, differing only in the comparative shortness of the stuffed and dried tail. They have the same peculiarities of the hands as described in the supposed specimens of *T. douglassii*, collected by Dr. Suckley at Steilacoom, namely, the very short first finger, the small palm and large claws, &c. The points of distinction are essentially in color, *G. borealis* having the upper parts of a bright yellowish brown or rufous, without any mottling of darker, much as in *T. fulvus* of Woodhouse; this color is replaced on the sides of the body anteriorly, and of the head by a dull yellowish grayish; this color seen also on the outside of the legs and the whole under parts, brightest on the belly. The inside of the pouches is of a clearer whitish. The tail is grayish white. The specimen labelled *Pseudostoma townsendii*, is a good deal larger, with a shorter tail; the colors above are still paler than in the first mentioned one, with less of the red and more yellow on the upper parts, and white beneath. There is a single middle patch of hairs, white to the base on the sternal region; elsewhere they are plumbeous at base as usual. The inside of the pouches is whitish, except the upper half of the wall next the head, which is plumbeous. The hairs of the pouch are rather thin set.

I do not feel satisfied, from differences of shade in color merely, to separate specimens as dis-

ting which are found in the same locality, and which agree in all essential points of structure. I have noticed almost parallel conditions in *T. umbrinus*, *T. bulbivorus*, &c. The whitening of the under parts may be the effect of age (as larger specimens show it most) or of season. Before this question can be definitely settled, it will be necessary to examine many more specimens of these species than have yet been seen by naturalists. When skulls of *T. douglassii* and of the supposed lighter *borealis* can be compared, the question will be nearer a solution.

Dr. Leconte is probably correct in referring the specimen in the academy, labelled *G. Richardsonii*, to the others above mentioned. In fact, by its darker under parts it approximates much closer to the typical colors of *douglassii*. The greater length of tail is owing to its having been skinned and stretched by thrusting in a sharp stick intended to replace the vertebrae. An elongation of fully half an inch can in this way be readily accomplished. The chin and pouches are quite distinctly white, in strong contrast with the darker parts around them. The colors above are more ashy than in the other two.

It is quite possible, as Dr. Leconte suggests, that *Geomys borealis* may be identical with *Thomomys rufescens*. Some remarks on this subject will be found in the article on the latter species.

Since the preparation of the preceding article, Dr. Newberry has collected a small gopher at Canoe Creek, California, which, though young, yet differs in some respects from *Thomomys bulbivorus* in the larger claws, and from both, this and *douglassii*, in the much lighter and nearly white under parts. The feet and tail are white. If *G. borealis* be a different species from *douglassii*, this specimen may possibly be referred to it.

List of specimens.

Catalogue number.	Corresp'g No of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.						Collected by—
							Nose to tail.	Tail to end of ver.	Fore foot, length.	Hind foot, length.	Fore claw, length.	Skull, length.	
1260	2225	♂	Canoe Creek, Cal.....	Aug., 1855	Lt. R. S. Williamson...	Mounted..	4.20	1.65	.80	.95	.32	1.13	Dr. Newberry.

THOMOMYS RUFESCENS, Maxim.

Fort Union Gopher.

Thomomys rufescens, PR. MAXIMILIAN, Nova Acta Acad. C. L. C. XIX, 1, 1839, 383.

WIEGMANN'S Archiv, 1841, II, 42.

BAIRD, PR. A. N. Sc. Phila. VII, April, 1855, 335.

SP. CH.—Cheek pouches rather small; densely furred. Tail nearly half as long as the body; thick at base. Upper incisors very large; the groove very shallow and obsolete. Feet very stout and broad. Claws of hand stout; not very long; much curved. Third claw 4 lines long above; beneath, occupying barely two-sixths of the total length; the claw of thumb reaching over two-fifths the hand.

Color.—Above, ashy or grayish yellow brown; sides similar. Beneath, with the pouches and surrounding area, yellowish white. Tail whitish; dusky above at the base.

This species possesses, in common with the one from Humboldt bay, the characteristics of long and thick tail, very powerful feet, and a size of skull apparently disproportionally great, in

comparison with that of the body. The cheek pouches are unusually small, which may, however, be owing in some measure to contraction in alcohol. The specimen was received whole in spirits, with the pouches everted.

The head is broad and large; the whiskers very short and grayish white; the ear margin quite distinct; the tail, nearly half the length of the body, everywhere completely covered with hair, except at the extreme and blunt point. The fur is rather soft, and full everywhere. The cheek pouches are small; densely coated everywhere with short, close, velvety hair.

As remarked above, the feet are unusually powerful, the claws particularly so; on the hands these are much curved, compressed and high, though not very long; the general proportions are not dissimilar to the *Steilacoom* species, though here the feet are actually larger; the middle claw, measured below, occupies about one-third the length of the whole hand, (with the claw,) or is nearly half the length of the palm and fingers; its finger, again, is nearly of this same length, and slightly shorter than the palm proper. The thumb is very small, reaching barely over two-fifths of the whole hand. The second finger is longer than the fourth; the fifth claw does not quite extend to the end of the bulb of the fourth finger. The hind feet are very broad, the first and second claws reaching further, respectively, than the fifth and fourth.

The incisors are yellow, nearly flat in front, or with but slight convexity in the cross sections. There is a distinct raised margin to the inner edge of the upper ones, though scarcely an incised furrow; they are also large in proportion to the rest of the skull.

The entire upper parts are of a pale grayish yellow brown, with a gloss of darker along the middle of the back, the tips of the hairs scarcely darker. The under parts generally, the entire fore legs, the hind feet, tail, and inside of the cheek pouches, are yellowish white with a faint tinge of reddish, particularly on the edge of the belly and outside of the fore legs. The base of the tail above has a slight point running on it like the back. There is a dusky spot around and behind the ear.

The specimen of this species described above was collected somewhere in the vicinity of Fort Pierre, Nebraska, in the summer of 1853, by Dr. John Evans, and preserved in alcohol. The measurements of body, head, and tail, were taken before skinning.

Measurements of 610.

	Inches.	Lines.
Nose to occiput.....	1	6
to root of tail.....	4	6
Tail, from root to end of vertebræ.....	2	1
hairs.....	2	1½
uncovered portion.....	1	8
Ears, height internally, above skull.....		1
Arm, fore foot to end of claws.....		10
palm.....		4½
longest claw, (above).....		4
and finger.....		6½
Leg, hind foot from heel to end of claws.....	1	1
longest claw.....		2
Skull, length.....	1	4

In the absence of specimens of this type of *Geomys* from the Columbia, especially of the originals of Dr. Bachman, I am unable to say whether this is identical or not with *G. borealis* or *townsendii*, although this is quite probable. That it is the same with the *Thomomys rufescens* of Maximilian I am satisfied, as the description agrees very well with it, the color being only more yellowish, and the specimen was collected within the same region with that of Prince Max. Richardson, in his report on North American Zoology, in the Reports of the British Association, (but nowhere else,) identifies *Geomys borealis* with the Saskatchewan species, previously supposed by him to be *G. talpoides*. Should the question of priority come up between *borealis* and *rufescens*, after they are conclusively shown to be the same, it must be settled in favor of the former, as having been published in the same year, but read by Dr. Bachman before the Philadelphia Academy, August 7, 1838, and by Prince Max., at Breslau, January 29, 1839. The species was named, but not described, by Richardson himself, in 1837.

Several specimens of gopher, collected at the mouth of the Yellowstone, by Lieut. Warren's Expedition, agree in general characters, but are smaller. The upper parts are rather light yellowish brown, the sides ashy gray; the under part, generally, grayish white; there is a dusky plumbeous tinge about the nose; the feet and tail are white.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—		
								Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.		Length of fore claw.	Length of skull.
610 1758		♂	Fort Pierre, Neb.	1853	Dr. J. Evans .....	....	Skin			1.50	4.50	2.08	2.12	.84	1.09	.33	1.33	.....
1776		♂	Fort Union, Neb	July 19, 1856	Lt. G. K. Warren ..	A	.....	.63	1.13	1.38	5.00	2.00	2.13	...	....	....	....	Dr. F. V. Hayden.
1777			do.	July 24, 1856	do. ....		.....								....	....	....	do.
.... 2512			Fort Randall.		do.		Skull.											do.

THOMOMYS UMBRINUS.

Sonora Gopher.

Geomys umbrinus, RICH. F. B. A. I, 1829, 202.—IB. Rep. British Assoc. for 1836, V, 1837, 157.

??WATERHOUSE, Charles. Mag. N. H. III, 1839, 596; fig of skull.

J. L. LECONTE, Pr. Ac. N. Sc. Phil. VI, 1852, 162.

Ascomys umbrinus, WAGNER, Suppl. Schreb. IV, 1843, 389.

Pseudostoma umbrinus, AUD. & BACH. N. Am. Quad. III, 1854, 307.

Sp. CH.—Cheek pouches large, rather sparsely haired on the outer wall. Tail slender, one-third to one-half the length of body, dusky all around with a white extremity. Upper incisors convex, the groove obsolete. Hand large; claws much curved, long; middle claw 5 lines, its under surface occupying more than two-sixths of the whole hand, its digit about two-eighths the same length. Claw of thumb reaching more than two-fifths over the hand.

Color.—Above, reddish brown, with a dorsal wash of very dark reddish brown; paler on the sides and beneath. No distinct mottling on the sides. Cheek pouches white inside to the margins; edges of the mouth all round and chin dark sooty brown, contrasting strongly. (No white.)

In very old specimens, the color above is paler and more gray brown; beneath, grayish white.

This species is of rather small size, (judging from the specimens examined,) as compared with others of the genus. The body is somewhat slender and depressed. No appreciable neck, but the head apparently the termination of the trunk as usual. The fur is soft and silky lustrous; not so soft as in *T. bulbivorus*. The external ears are distinctly visible as an elevated

margin to the auditory aperture. The whiskers are shorter than the head, mixed dusky and gray. The upper incisors are yellow, rather plane in front, with a very obsolete groove near the inner slightly raised edge. The cheek pouches are large, extending backwards at least to the occiput (in the dried specimens); densely lined with hair on the side next the jaw, more sparsely on the outer side. The tail is contained not quite two and a half times in the length of the body, in one specimen little over twice; it is well covered with short hairs.

The feet are hardly large, although the claws themselves are more developed than in *Thomomys bulbivorus*. The longest claw projects beyond its digits (beneath) more than one-third the length of the entire foot, and is decidedly longer than its digit. The first finger is well developed, its claw reaching a little beyond the base of the central one. The second claw reaches rather further than the fourth; the end of the fifth to the base of the fourth. The claws are all large, stout, and decidedly acuminate at the tip. The claws of the hind feet are short, conical, and but little curved. The first toe is longer than the fifth, the second larger than the fourth, the third longest; the palms and soles naked, but the digits bordered by stiff hairs on each side.

The prevailing color everywhere above and below is a rich reddish brown or dark cinnamon; brightest on the sides and neck, duller and more mixed with ashy on the belly; while along the vertebral region is a uniform broad wash of dark brown, extending from the snout to the root of the tail. There is little or none of the fine lining or mottling with dark brown or black extending over the sides to the edges of the belly, as in *T. bulbivorus*, but this appears concentrated in a uniform wash as described along the dorsal line, leaving the sides but little different from the belly, except in being brighter. The bases of the feet and the basal two-thirds of the tail all round are dusky, like the body; the digits and extremity of the tail, with the inside of the pouches are white. The chin, sides of the snout, and region bordering the pouches are purplish brown, the region of the ears dusky. The claws are yellowish, except where they show the extravasated blood through them. The fur is everywhere lead color at the base.

Measurements, (dry skins.)

	No. 154.	No. 149.
	Inches.	Inches.
Nose to occiput, about	1. 60	-----
to eye, about	. 83	-----
to ear.....	1. 33	-----
to root of tail	6. 33	5. 50
Tail, from root to end of vertebræ	2. 50	2. 50
from root to end of hairs	2. 54	2. 60
uncovered portion	? 2. 08	? 2. 00
Ears, height internally above skull.....	. 10	. 11
width.....	. 16	-----
Arm, fore foot to end of claws, (cramped).....	. 86	. 80
fore foot, longest claw	. 42	. 33
longest claw and toe.....	. 54	. 50
Leg, hind foot from heel to end of claws.....	1. 00	. 94
hind foot, longest claw	. 21	. 17

The specimens No. 154, 149, agree very well with each other, the colors of the latter and smaller one being brightest.

A specimen (611) collected by Dr. Henry, probably at the Copper Mines, agrees in all essential characters, except that the furrow of the incisors is a little more distinct, and the reddish of the under parts is a little more mixed with paler. Another of much larger size, (612,) appears bleached; the under parts being much paler than as above described. The body measures nearly eight inches. The tail is, unfortunately, mutilated, by having been broken off near the base; the wound is, however, cicatrized. This mutilation of the tail is very common among the species of *Geomys*, rendering it difficult to apply the proportional length of this member as a specific character. It is probable that this result is produced in the course of the contests in which male mammals periodically indulge.

This species, in general appearance, has a close resemblance to *T. bulbivorus*, from the Pacific coast, though a careful comparison shows many points of difference, which, though slight, are as characteristic as generally prevails in this group. The claws are uniformly longer, stouter, and considerably more curved. The toes, however, are shorter, as well as the hind feet. The tail is rather longer, and in most cases is uniformly dusky all round, above and below, except the terminal third or fourth, while in *T. bulbivorus* the tail is grayish white with a dusky line running to a point on the upper half from the base. *T. bulbivorus* exhibits no wash of very dark reddish brown on the back, but is finely mottled with dusky, almost the same on the sides and flanks as on the back; instead of having the latter decidedly lighter, clearer, and more uniform than the back. The groove on the inner edge of the upper incisor is rather obsolete in both, most distinct in *T. bulbivorus*. I do not find any appreciable difference in the skulls, except what may naturally arise from the comparison of unequal ages.

In this species I am inclined to recognize the long lost *Geomys umbrinus* of Richardson, received by Leadbeater from the "town of Cadadaiguos, in the southwestern part of Louisiana." I have not been able to find this locality mentioned anywhere in North America, not to mention Louisiana; it may be some obscure locality in Texas, Arkansas, or New Mexico, known at the date of its reception by Leadbeater, (prior to 1829,) but since forgotten. There are some differences from the description to be noticed in most of the specimens. Thus I do not find that the fur has the "lustre and appearance of that of the muskrat;" nor are the sides of the mouth dark brown, the chin and throat white, as described in *Geomys umbrinus*. On the contrary, the chin is sooty black or brown, the throat and under parts usually chestnut. Still, Richardson's specimen may have presented these variations from the type, and I do not feel willing to run the risk of encumbering science with another synonym by proposing a new name without further opportunities of investigation.

G. umbrinus is described as having smooth upper incisors, but I know of no species entirely devoid of a furrow, though this may be very obsolete, as is the case with the specimens before me.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collect'd	Whence and how obtained.	Original number.	Nature of spec.	Measurements.										Collected by—				
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.	Fore claw.	Length of skull.		Width of skull.	Width of muzzle.	Width of incisors.	
271	1688	♂	Sand Cr., Cimarron river, N. M.		John Potts.....		Skin ..															
2669			Ft. Stanton, N. M. ...	1855...	Dr. T. C. Henry..		do...															
2670			do.....		do.....		do.....															
2671			do.....		do.....		do.....															
2625			Ft. Bliss, N. M.		Dr. S.W. Crawford		In alc.	.86	1.20	1.47	4.00	2.00		.80	.95	.29						
154	1136		Ft. Webster, (Copper Mines), N. M.		Col. J. D. Graham ..		Skin....			1.60	6.33	2.50	2.54	.83	1.00	.42						J. H. Clark.....
611			do.....		Dr. T. C. Henry..		do.....				6.00					.42						
612			do.....		do.....		do.....				7.83					.42						
149	1131		Santa Cruz, Sonora.		Col. J. D. Graham ..		do.....				5.50	2.50	2.58	.80	.94	.33	1.36	.84	.30	.15		J. H. Clark.....
1036	2212		Espia, Sonora.....		Maj. W. H. Emory ..		Mount'd									1.42	.83	.28	.14			Dr. C.B. Kennerly
21331			Santa Isabel, Cal. ...	Nov. 26, 1854...	do.....	1	Skin....															A. Schott.....

THOMOMYS FULVUS.

Geomys fulvus, WOODHOUSE, Pr. A. N. Sc. Phil. VI, Dec. 1852, 201.—*IB.* Sitgreaves Exp. Zuni and Colorado, 1853, 51; pl. v. Mammals.

Pseudostoma (Geomys) fulvus, AUD. and BACH. N. Am. Quad. III, 1854, 300.

SP. CH.—Check pouches moderately large, well clothed with hair. Tail nearly half as long as the body, thick at base. Extremities large. Claws large, not much curved. Third claw of hand $4\frac{1}{2}$ line long above; beneath, extending over two-sixths the whole hand; its digits about two-ninths the same length. Claw of the third reaching to two-fifths of the hand.

Color.—Above and on the sides, bright uniform reddish brown; beneath yellowish white, with a tinge of chestnut on the belly. Pouches white at the bottom, chestnut around and in the margins, chin dusky. Tail white; dusky above at the at the base.

This species resembles in external appearance the specimen of *T. rufescens*, from Fort Pierre, more closely than any other with which I have compared it; the body being short and stout, the feet large, the tail long, &c. The cheek pouches are not large, although it is difficult to ascertain this in specimens preserved either dry or in alcohol, owing to the contractility of the fibrous tissue. The ear margins are small but distinct; the tail is thick and nearly half as long as the body, well covered with close stiff hairs. The claws are very long on all the feet, quite slender, and not much curved. The middle claw of the hand, measured on its lower side, occupies about two-fifths of the whole hand, its finger being only about two-thirds this length, and little more than half the length of the palm. The tip of the first claw reaches over the basal two-fifths of the whole hand; that of the fifth to beyond the middle and nearly, but not quite, to the base, below, of the third claw. As usual, the first and second hind toes are longer, respectively, than the fifth and fourth.

The prevailing color on the back and sides is a clear and bright reddish brown; darkened slightly along the dorsal region and on top of the head by dusky tips to the hairs. The flanks, outside of forearm, tail, and under parts generally, yellowish white; the abdomen, with a faint

rufous tinge. The ears and the edges of the lips are dusky; the edges of the cheek pouches like the back but fainter, their inside whitish. The base of the tail is colored like the back.

This specimen was collected by Dr. Woodhouse, in the San Francisco Mountains, and described by him in Sitgreaves' Report. There is no skull accompanying it, but Dr. Woodhouse states that it has smooth upper incisors, probably with the usual internal groove.

Several gophers from San Diego are rather darker than that of Dr. Woodhouse, but differ in much the same characters as *fulvus* from other species. The incisors are more than usually grooved; the tail and claws longer than in *T. bulbivorus*.

List of specimens.

Catalogue number.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—		
					Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.		Length of fore claw.	Length of hind claw.
2674 ¹	San Francisco mts., N. M.	1851.....	Capt. L. Sitgreaves.	Mounted	.60	.....	.....	5.00	2.33	2.42	.92	1.08	.38	.21	Dr. S. W. Woodhouse.
?1330	Fort Yuma, Cal.....	Jan. 2, 1855	Maj. W. H. Emory.	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	A. Schott.....
2642	San Diego, Cal.....	.....	Dr. J. F. Hammond.	In alc.....	.73	1.30	1.75	4.90	2.38	.....	1.05	1.20	.40	.....	.....
2643	do.....	.....	.....do.....	do.....	.60	1.01	1.35	3.80	1.57	.....	.78	.90	.26	.....	.....
2644	do.....	.....	.....do.....	do.....	.60	1.03	1.30	3.50	1.82	.....	.80	.92	.23	.....	.....

¹ Naked portion of tail, 1.56 inches; longest fore finger, exclusive of claw, .21.

I have thus concluded what is to me a very unsatisfactory account of the gophers with smooth incisors, and can only hope that better materials may enable me, or some one else, hereafter to throw more light on the subject. It will be sufficiently evident from an examination of the different series of measurements that the comparative length of the tail, as derived from skins, is a very uncertain character, since in the entire animal the tail in nearly all the species is but little less than half the length of the body.

I have enumerated all the North American gophers in the preceding pages described by authors, with the exception of the *Geomys talpoides* of Richardson, of which I propose to give a brief account taken from the Fauna Boreali Americana, for the purpose of completing the account of the genus.

THOMOMYS TALPOIDES.

Cricetus talpoides, RICH. Zool. Jour. III, Ap. 1828, 518.

Geomys talpoides, RICH. F. Bor. Amer. I, 1829, 204.—IB. Rep. British Assoc. Adv. Sc. for 1836, V, 1837, 157.

(Stated here to come from Florida.)

LECONTE, Pr. A. N. Sc. Phil. VI, 1852, 162.

Saccophorus talpoides, FISCHER, Synop. 1829, 588.

Ascomys talpoides, WAGNER, Suppl. Schreb. III, 1843, 390.

Pseudostoma talpoides, AUD. & BACH. N. Am. Quad. III, 1853, 43; pl. cx.

Thomomys talpoides, GIEBEL, Säugt. 1855, 530.

SP. CH.—Hind foot with only four distinct toes; a fifth very rudimentary. Color, grayish black; chin, throat and tail white.

Unless Dr. Richardson was in error in assigning four toes to the hind feet as the normal

character of this animal, it is in this way readily distinguishable from any other described species of *Thomomys*. The fore foot is said to have a rudimentary thumb; the middle toe longest, the first and third equal, (second and fourth?) the outer one is shorter and far back, the thumb still further back. The rudimentary fifth toe is so small as to be scarcely discernible.

The cheek pouches are covered on the outside with hair of the same color as that on the back; but beneath and on their posterior margins their color is white. On the head and body the fur is of a grayish black color, with a faint brownish reflection in some lights; it is as fine as that of the mole, but not so velvety. Chin and throat white. The tail is very short and cylindrical, and covered by a close smooth coat of short white hairs.

	Inches.
Length of head and body.....	7.00
tail.....	1.84
Nose to eye.....	.75
ear.....	1.25
Fore foot.....	.90
Middle fore claw.....	.33
Hind foot.....	.92

The specimen described was obtained from Hudson's Bay, and is now in the museum of the Zoological Society.

SUB-FAMILY SACCOMYINAE.

Skull delicate ; snout, elongated, tapering, and acute. No ante-orbital foramen, but a wide opening directly into the side of the maxillary. Nasals projecting considerably in advance of the incisors. Mastoid bone very much developed, and forming the greater part of the upper surface of the cranium as well as the most posterior part of the occiput. Body slender, graceful ; hind feet elongated. Tail long. Fore claws moderate, though exceeding the hinder ones.

The skull between the orbits is much broader than in the *Geomyina*. The palate is nearly horizontal throughout. The *meatus auditorius externus* is a simple pit in the swollen mastoid bone, without any projecting rim. Other characteristics will be found in the detailed descriptions of the genera.

The sub-family in North America is constituted by the genera *Dipodomys* and *Perognathus*, both confined to the region west of the Missouri, although reaching as far north as 48° or 49°. Mexico has several species. The genus *Sacomys*¹ of F. Cuvier finds here its place. But little is actually known of it, and its locality ("North America") is very uncertain. It is supposed, however, to come from some of the West India islands. It has the upper incisors without any groove. The genus *Heteromys*² of Waterhouse also probably belongs in the same group, although I have been unable to find it characterized.

¹ *Sacomys anthophilus*, Fr. Cuv. Mem. du Museum, X, 1823, 419 ; plate xxvi. Supposed to have come from North America from having a North American plant in its pouches.

² A species of *Heteromys* (*H. desmarestiana*) is named, but not described, by J. E. Gray, as coming from Coban, Central America. Pr. Zool. Soc. London, XI, 1843, 79.

DIPODOMYS, Gray.

Dipodomys, GRAY, Ann. and Mag. N. H. VII, Aug. 1840, 521.

AUD. and BACH. N. A. Quad. III, 1853, 137.

? *Macrocolus*, WAGNER, Wieg. Archiv, 1846, I, 176.

The species of this genus are characterized by the large, broad, depressed head, large rounded ears, acute snout, ample cheek pouches, opening externally. Each foot with the first digit rudimentary, but bearing a short claw; the four remaining, moderately developed, with rather long claws; those on the fore feet longest. Tail as long or longer than the body; covered with hair which is longer and brush-like towards the tip. The hind legs are very long, jerboa-like. The under surface of the hind feet densely furred to the claws.

Upper incisors longitudinally grooved. Molars rootless. Occipital plane deeply emarginated. Zygoma very slender.

The species are generally yellowish brown, or brownish above, with a white spot above the eye and behind the ears; the under parts, a stripe from the abdomen across the thighs to the tail; the base of the tail and a stripe on each side of it white.

The skull of the genus *Dipodomys* is very remarkable in its general characteristics, differing measurably from that of all other American rodents, excepting its allies among the Saccomyinae. It is excessively broad, and yet much depressed, its greatest width more than twice its depth, and about equal to the length from occiput to nasal bones. The outline, viewed from above, is slightly oval, broadest behind, and well rounded at either end, with the narrow and tapering snout springing abruptly forward, and extending so far that the nasal bones occupy at least one-third of the total length. The posterior part of the oval shows a deep rounded notch, the bottom of which is constituted by the occipital bone, bounded on either side by the backward projection of the auditory bullæ, which thus extend far posterior to the occipital bone. The sides of the oval are interrupted by a deep quadrate notch, forming the boundaries of the orbit.

Viewed laterally, the skull is highest just above the orbits; the dorsal outline slopes anteriorly with a very gentle concavity to the end of the snout; posteriorly, it is nearly straight to the occipital region, where it becomes rapidly convex. The lower outline is nearly straight.

A striking peculiarity in the skull of *Dipodomys* is the entire absence of ridges or crests, and the rounding off of all the angles on the upper surface, and the posterior half generally. The only angular bends in the skull are the upper edge, anteriorly, of the orbit, and the anterior edge of the zygomatic process of the maxillary.

The snout, as already remarked, is very narrow and tapering, as well as considerably elongated. The nasal bones project considerably beyond the incisors, applied, however, for nearly the whole distance, against a vertical plate of the intermaxillary. The edges of the nasal, and the nasal process of the intermaxillary, are bent downwards into a short cylinder, interrupted below by a slit twice the width of an incisor. There is also a narrow plate which projects forwards between the upper half of the incisors as exposed, formed by the junction of their inner alveolar walls. For the posterior half, the nasal bones are linear with parallel sides, and do not reach back nearly as far as opposite the orbit.

The nasal process of the intermaxillary is also linear, rather narrower than the nasal bones, and extending a little posterior to these; they first make their appearance on the upper surface of the skull along the middle of the nasals.

The frontal bone extends considerably forward, and runs out to an acute point on either side between the nasal process of the intermaxillary and the zygomatic of the maxillary, reaching,

however, to the anterior edge of the skull. The parietals are nearly right angled triangles in shape, bounded behind by the interparietal and the occipital, postero-laterally by the temporal, and sending a narrow process round the edge of the orbit of which it forms the posterior-internal corner.

The temporal bone is of very great extent and of unusual development—the two, in fact, constituting more than one-half of the entire skull. This development is principally in the mastoid portion, the sinuses of which are very large. There is no outer tube to the meatus externus, which opens directly into the bone; the cavity, however, with a thin wall. As already stated, this highly cellular mastoid portion constitutes the most posterior part of the occiput; the two of opposite sides, in fact, in their projection, presenting a ludicrously close resemblance to the buttocks of the squatting human figure. The petrous portions, too, are of large size, and conical; they project forwards and inwards until they come in contact below the spheroid, a little anterior to its junction with the base occipital; the union distinctly visible externally. The squamous portion lines the posterior half of the orbit.

The occipital bone is most remarkable in its reduced dimensions; it may be considered in three portions: a posterior, inferior, and superior. The posterior portion is merely an inverted V, with narrow and linear branches, which, coalescing above into one, pass a short distance around on the superior surface of the head, when the bone is again bifurcated; the branches linear, and but little divergent, and extend forward to near a very short posterior process of the parietal. The branches thus formed enclose a nearly quadrilateral and elongated interparietal, the anterior end of which alone rests against the parietal. The inferior portion of the occipital, again, is Y-shaped, the fork bounding the lower portion of the foramen magnum, and bearing the narrow and elongated condyles, the body of the Y extending forward and abutting against the anterior and united ends of the petrous bone. There is a narrow fissure along the whole of the basilar and condyloid portion of the occipital, between it and the petrous bone. The foramen magnum itself is very large, much higher than wide, and situated two-thirds in the posterior portion of the occiput, and one-third in the inferior.

The maxillary bone extends far forward on the sides, reaching almost to the incisors. Just within its lateral suture with the intermaxillary, and about on the middle of the side of the snout, is a very large perforation in the bone, opening directly into the nasal cavity. This is nearly as large as the tip of the muzzle, the aperture rounded anteriorly, straight posteriorly. This perforation, which I have never seen anywhere else except in *Perognathus*, seems to replace the ante-orbital foramen, of which there are no traces. The zygomatic plate of the maxillary is of moderate extent, and on its superior portion it sends backwards a broad plate, overhanging the orbit for about one-third, and forming a portion of the upper surface of the head. It is united to the frontal, and the lachrymal bone is situated in the angle between these two bones. The inferior edge of the zygomatic plate, springing from the side of the maxillary, has a very deep rounded notch bounded externally by a narrow acute process, which, passing backwards, articulates with the very slender needle-like malar bone. The posterior end of the malar abuts directly against the petrous bone, although also articulating with the squamous.

The lower jaw is slender and delicate, in fact, unusually small in proportion to the size of the skull. The distance from the molars to the incisors is very short, and there is very little contraction towards the incisors, the depth being much the same from the incisor-alveoli to the coronoid process. The postero-inferior angle of the jaw is twisted so as to occupy an angle of more than 45 degrees with a vertical plane, the upper angle being produced upwards and

outwards to an obtuse point. The condyloid process is much compressed and quite deep, with upper and lower edges nearly parallel, and ends in an elongated ovate condyle. There is a distinct tubercle at the outer base of the condyloid process in the gap between this and the ascending point of the angle of the lower jaw. This covers the posterior extremity of the incisor. The coronoid process is small and prickle-shaped. Its plane is a little exterior to that of the condyloid process, and in a line with the tubercle just mentioned. There is a deep pit between the last molar and the condyloid process, on its inner side.

The palatine surface of the skull is very limited, although it all lies in one plane, as far as the immediate region of the incisors, where it bends downwards for a short distance along the incisors. Immediately anterior to the molars it contracts and continues very narrow. The external boundary of the palate here is formed by a ridge, which diverges from its fellow opposite the incisive foramen, and passes over on to the side of the snout along the maxillary suture. The incisive foramina are quite large, though narrow, situated one-half in the maxillary, and half in the intermaxillary. Their anterior extremity is midway between the molars and the anterior base of the incisors, the entire length about equal to the three last molars. The width of palate on either side of the foramina is scarcely greater than that of one of the incisive foramina themselves. On the posterior edge of the palate there is an angular notch at either side, which extends nearly to the second molar.

The inner lines of the molar alveoli are perfectly straight, but convergent, so that they would intersect a little in advance of the incisors. The external lines are convex. The total length of the four upper molars is only from one-eighth to one-ninth of the entire length of the skull. The molars themselves, four on each side, above and below, are prismatic and rootless. They are inserted in a convergent manner, so that the axes of the first and last would intersect at from one-fourth to one-half an inch from their crowns. The crowns of the molars are transversely elliptical, diminishing from first to last, which is subcircular or trigonal. In the old and worn tooth, there is a simple compressed cylinder of enamel, enclosing dentine, the centre of which is hardest. There is also a slight groove on the outer edge of the crowns of both upper and lower. In the unworn full grown tooth, there is a distinct notch in the middle of the exterior edge of both upper and lower molars, caused by the indentation of the enamel. This indentation is but slight, and becomes ground away, until we have, in old specimens, the perfectly simple external cylinder of enamel, as in some edentates. On the anterior molars of both jaws, however, the indentation is on the inner edge.

The first, or deciduous premolar, remains till very late in life, and is distinctly rooted, its successor, however, being rootless like the rest. It is considerably larger than its successor, and has a rather close resemblance to the first molar of the genus *Mus*, in the three transverse tuberculated ridges.

The incisors are very small and delicate. The upper incisors have their root just under the anterior extremity of the ridge separating the anterior face of the zygomatic process of the maxillary from the superior, and their course is easily traceable by the bulging out of the sides of the muzzle. The anterior face is deeply grooved, its outer half, at the same time, being rabbeted out, so that the groove is visible with equal distinctness from in front and on the sides. The corners, too, of the tooth are rounder. The lower incisors are rounded, but not grooved.

The skeleton of *Dipodomys ordii* has 7 cervical, 12 dorsal, 9 lumbar, 4 sacral, and 28 caudal vertebrae = 60. The second, third, and fourth cervical are firmly anchylosed together, with a joint upper spinous process. The hind legs are disproportionately elongated; the metatarsal

and metacarpal are five in number, and distinct throughout, although the inner in each is quite small, and bears a diminutive, scarcely appreciable claw. The clavicles are perfect; the tibia and fibula united below, at about the middle of the former.

In Wiegmann's Archiv for 1846, page 172, Dr. A. Wagner gives a detailed account of a new genus of rodents from Mexico, called by him *Macrocolus*. (Species, *M. halticus*.) Although Wagner expressly states that there were no external cheek pouches in his specimen, and that, in consequence, it could not belong to Gray's genus, *Dipodomys*, yet the coincidence in every other respect, skull, teeth, skeleton, and external form, is so very intimate as to render it almost certain that the cheek pouches must have been overlooked, especially as we are particularly informed that the specimen was in very defective condition as preserved in alcohol. The species was probably identical with that described by Gray, viz: *D. phillipii*, which appears to be the one common in Mexico. The entire skeleton, with details of the skull, was afterwards figured by Wagner, in Math. Phys. Abhandlungen der K. B. Akademie of Munich, V, 1848, plate vii.

The determination of the species of *Dipodomys* is a matter of much uncertainty, in our ignorance of the true value of the characters upon which the species have been based. These are the amount of development of the antitragus, the color of the fur, the comparative length of the tail, and the color of the terminal portion of the latter. The uncertainty has been increased by the determinations having been made on skins stuffed to greater or less than natural size. Now, judging from analogy, there may be a considerable variation in the proportions of body and tail without involving specific diversity, and the color of the body may vary with age and season from light to dark, as it does in other rodents, and particularly in the gophers, (*Geomys* and *Thomomys*.) The specimens before me present every connecting link between the two extremes of coloration of the tail, and I would not be at all surprised if our North American species were to be properly reducible to two, one a short-tailed species from New Mexico and the Rocky Mountains, and the other a long-tailed one from California and Oregon. At the same time it is not yet certain that either of these species, or which one, is the same with the *Dipodomys phillipii* of J. E. Gray.¹

The figure and part of the description of Audubon and Bachman are taken from this identical specimen described by Gray, which resembles the white tipped specimen from Fort Reading, although the colors on the plate are more yellowish than Gray's description will warrant.

Whatever the number of species, all hitherto detected in North America belong to the two following sections:

SECTION I. Hind foot not exceeding 1.50 inches, usually appreciably less; about one-third the length of head and body. Tail vertebræ about $1\frac{1}{4}$ times the length of head and body in nature; rarely exceeding 5 inches, never $5\frac{1}{4}$. *D. ordii*.

SECTION II. Hind foot, 1.60 inches, sometimes more; always considerably exceeding 1.50; almost half as long as the head and body in the fresh specimen. Tail vertebræ $1\frac{1}{4}$ times as long as the head and body, always exceeding $5\frac{1}{4}$ inches; usually from six to seven inches. *D. phillipii*, *D. agilis*.

The species of *Dipodomys* are found from Real del Monte, Mexico, along the high lands as far

¹ *Dipodomys phillipii*, GRAY.—Gray brown, with longer black hairs; sides sandy; sides of the nose, spot near the base of the ears, band across the thigh, and beneath, pure white; nose, spot at the base of the long black whiskers, and at the base of the tail, black; tail, black brown, with the band on each of its sides and tip white; penis ending in a long spine. Length of head and body, 5 inches; tail, $6\frac{1}{2}$ inches; hind feet, $1\frac{1}{2}$ inch. Inhabits Real del Monte, Mexico. Specimen in British Museum. Annals and Magazine of Natural History, VII, August, 1841, 521.

as the Platte, on one side of the Rocky Mountains, and to the Columbia river on the other; thence west to the Pacific.

DIPODOMYS ORDII, Woodhouse.

Kangaroo Rat.

Dipodomys ordii, (WOODHOUSE,) LEC. PR A. N. SC. Phila. VI, Jan. 1853, 224.

WOODHOUSE, PR. A. N. SC. Phila. VI, Jan. 1853, 235.—IB. Sitgreaves' Report Expl. Zuffi, 1853, 50; pl. iv, Mammals.

AUD. & BACH. N. AM. Quad. III, 1854, 317.

? *Dipodomys montanus*, BAIRD, PR. A. N. SC. Phila. VII, April, 1855, 334.

SP. CH.—Above, yellowish brown, the back little darker. Tail about as long as the body, with an erect crest of long hairs towards the end. A dusky stripe on the upper part of the tail to the tip, where, however, the hairs are white at the base. A dark stripe beneath the tail, which runs out on the terminal fourth, leaving the rest white. The antitragus low.

Varies in darker color, white tip to tail, &c.

Head very broad and snout acute. Ears broad and large; antitragus low, narrow. Whiskers much longer than the head. Thumb with a short curved claw; the other claws very long; the third longest; fourth scarcely shorter; the second longer than the fifth; palms smooth. The rudimentary first toe provided with a short claw; the third and fourth longest; the second a little shorter; the claw of the fifth not reaching to that of the fourth; all the claws nearly straight and shorter than those on the fore feet. The under surface of hind feet, from heel to claws, is densely furred, so as to conceal the skin, even on the toes. Tail vertebræ about equal to the head and body, or about one-fourth longer, and unusually thick. The hairs of the tail somewhat close pressed towards the base, but elongating gradually to the tip on the upper surface; not materially so on the lower; this lengthening beginning at about the middle of the tail, and the hairs standing up like a compressed crest.

The prevailing color of the upper parts and sides is of a clear light yellowish brown, with a little intermixture of dark grayish on the back. This is owing in great part to the effect of the lead colored bases of the hairs, the bases of those on the sides being white. The tip and sides of the snout, a patch above the orbit and behind the ears, the entire under parts, lower half of the sides, and the limbs, have the hairs snowy white to the base, except a distinct line down the centre of the soles, which is of a grayish lead color. There is also a white line across the thighs to the base of the tail. The space above, occupied by the yellowish brown described, has the hairs bright metallic lead color at the base, except on the middle of the sides, where they are white.

The tail is white, with a broad distinct stripe of grayish lead color above, which extends from near the base to the tip. The hairs, however, are white at the base, except sometimes towards the more brush-like tip, where they are uniform in color. On the lower side of the tail is a corresponding strip extending over nearly two-thirds of the total length, when it runs out to a point and disappears; the sides of the tail between these stripes is pure white, and the terminal third also, except on the upper side and extreme tip for about half an inch.

There is not much variation with different specimens of this species; in one or two (533) the dark band beneath the tail extends further along towards the tip.

In the preceding paragraph I have described a typical specimen of *Dipodomys ordii*, agreeing very well with the animal of Woodhouse. Finding among Captain Beckwith's collections a large *Dipodomys*, differing materially in certain respects, I described it as new, under the name

of *D. montanus*. Since then, however, I have been led to believe that the colors of body and tail may vary more than was imagined, and I am now inclined to think that this animal is really *D. ordii*. It is, however, still quite unique in the white tip to the short tail, and I have concluded it best to publish the description prepared for it, as follows:

SP. CH.—Above, yellowish brown, mixed with a good deal of dusky; tail rather longer than the body, with a dusky stripe on its upper and under surfaces extending to the tip; the hairs on the extreme tip, however, being white. The white stripes on the sides are continued to the end of the tail; a decided crest above at the end.

This animal is among the largest of the genus, and in general characters occupies a position intermediate between *D. ordii* and *D. phillipii*. The head is broad and the snout acute. The ears are large, broad, and coated densely behind with long appressed hairs; the antitragus not much developed. The tail is longer than the body, proportionally longer than in *D. ordii*, and thicker than usual in the genus. The hairs upon it are unusually long, elongating crest-like on the terminal third, and the hairs increasing in length to the tip, where they measure an inch. On the lower edge this elongation is only distinct near the tip. The fore claws are shorter than usual.

The upper parts are dusky yellowish brown, clearer on the sides; the general tints darker than in *D. ordii*. There is the usual light spot above the eye, on the side of the face, and behind the ear, and the light line across the thigh. The hairs on the exterior face of the ear, including the posterior half and inflexed portion superiorly, are dusky lead color. The tail is white, with a dusky lead colored stripe on the upper and under sides from the base to the end, the hairs springing from the extreme tip being white to their base; the basal portion of the hairs on the upper surface of the tail towards the tip being white also; those beneath, principally lead color. The lateral white stripes are continuous to the extremity.

This species is readily distinguishable from *D. ordii* by the longer tail, which has the hairs on the extreme tip white, not colored, and the under surface also penicillate; the ears are dusky exteriorly. The colors above also are duskier. The tail is shorter than in any of the other species described, the dusky line below extending to the very tips of the hairs. The colors are generally darker than in *D. phillipii*, lighter than in *D. agilis*.

To sum up the whole case in a few words, therefore, I may state that, in the specimens from New Mexico, there are two distinct types of coloration; one (*Dipodomys ordii*) with the upper parts light yellowish brown, without any indication of plumbeous; the tail with the upper surface dusky to the tip, including all that portion beyond the end of the vertebræ; on the under surface the dark stripe ceases on the terminal third or fourth of the tail, the tail being entirely white except at the end. The bases of the hairs above are, however, more or less white.

In the other section, (*D. montanus*), the upper parts are more plumbeous; the plumbeous stripes on the upper and under surfaces of the tail extend to the very tip. In one specimen, (490,) the hairs of the extreme tip are entirely white, in others it is entirely plumbeous, and even for some distance posterior to the end of the vertebræ. Whether, however, this is any more than a variation of the same species can only be settled by additional observations.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.										Collected by—
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of ver.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	
1921 ¹	....	♂	Platte river.....	Sep. 15, 1856	Lt. F. T. Bryan.....	336	Alcohol...	.80	1.40	1.50	3.50	4.65	5.05	.50	1.51	....	....	W. S. Wood..
442 ²	1307	..	Huerfano river, N. M..	1853	Capt. E. G. Beckwith.....	.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	1.48	.98	Mr. Kreutzfeldt
490 ³	1631	..	Near Ft. Massachusetts	1853	 do.....	11	do.....	.....	.....	1.75	4.50	5.25	6.33	.50	.....	.....	.....	do.....
491 ⁴	1632	..	Llano Estacado, (western part.)	1854	Capt. J. Pope.....	.....	do.....	.....	.....	.....	4.45	5.25	.....	.....	1.50	1.43	.....	do.....
492 ⁵	1633	..	 do.....	1854	 do.....	.....	do.....	.....	.....	.....	4.33	4.50	5.37	.40	1.50	.....	.....	.....
534 ⁵	.....	.....	..... do.....	1854	 do.....	.....	do.....	.....	.....	.....	4.13	4.60	.....	.....	1.35	.....	.....	.....
1739 ⁵	.....	.....	Pecos river, N. M.....	May 27, 1856	 do.....	114	do.....	.....	.....	.....	5.00	.....	.....	.....	1.44	.....	.....	.....
1741 ¹	.....	.....	..... do.....	June 24, 1856	 do.....	202	do.....	.....	.....	.....	4.00	5.00	5.65	.40	1.40	.....	.....	.....
1742 ⁵	.....	.....	..... do.....	July 12, 1856	 do.....	204	do.....	.....	.....	.....	4.40	.....	.....	.....	1.46	.....	.....	.....
613 ¹	1764	.....	Western Texas.....	1854	 do.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	1.26	.85	.....	.....
2675 ⁵	.....	.....	Waco Tanks, N. M.....	Mar. 13, 1856	 do.....	.....	do.....	.....	.....	.....	5.12	.....	.....	.....	1.35	.....	.....	.....
533 ¹	.....	.....	Organ mountains, N.M.	.....	Dr. T. H. Webb.....	.....	do.....	.90	.....	1.50	4.50	5.25	.....	.....	1.35	.....	.....	.....
531 ¹	.....	.....	Fort Thorn, N. M.....	.....	Dr. T. C. Henry.....	.....	do.....	.....	.....	.....	4.50	.....	.....	.....	1.45	.....	.....	.....
532 ¹	.....	.....	..... do.....	.....	..... do.....	.....	do.....	.....	.....	.....	4.62	4.80	5.62	.42	1.46	.....	.....	.....
560 ¹	1066	.....	El Paso, Texas.....	.....	Col. J. D. Graham.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	1.39	.91	Chas. Wright.	
1044 ⁴	2209	..	Mesilla Valley.....	1855	Maj. W. H. Emory.....	.....	Mounted.	.....	.....	.....	.....	.....	.....	.....	1.44	.95	Dr. Kennerly..	
143 ¹	1125	.....	Santa Cruz, Sonora.....	.....	Col. J. D. Graham.....	.....	Skin.....	.....	.....	.....	4.25	.....	.....	.....	1.46	1.47	.97	J. H. Clark...
372 ¹	1286	○	Durango, Mexico.....	.....	Dr. T. H. Webb.....	.....	Mounted.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2621 ¹	.....	.....	Coahuila, Mexico ⁶ ..	.....	Lt. D. N. Couch.....	.....	In alc.....	.90	1.40	1.60	4.00	5.30	5.95	.55	1.46	.....	.....	.....

¹ Light yellowish red: *D. ordii*.² More dusky: *D. montanus*.³ Dusky; white tip to the tail; type of *Dipodomys montanus*.⁴ Rather dusky; tail dusky at the end.⁵ Probably near Santa Catarina.

DIPODOMYS PHILLIPPI, Gray.

Dipodomys phillipii, GRAY, Annals and Mag. Nat. Hist. VII, 1840, 521.—IB. Sill. Am. J. Sc. XLII, 1842, 335. (Real del Monte.)

WAGNER, Suppl. Schreb. III, 1843, 295.

LECONTE, Pr. A. N. Sc. VI, 1853, 224. (San Diego.)

Dipodomys phillipsii, AUD. & BACH. N. Am. Quad. III, 1853, 137; pl. cxxx. (The figure derived from Gray's specimen; description uncertain.)? *Macrocolus haiticus*, WAGNER, Wieg. Archiv, 1846, I, 172.—IB. Abhandl. K. Baier. Akad. XXII, 1845, 319.

GIEBEL, Säugt. 1855, 599.

Above yellowish brown. Tail very long, much exceeding the body; the upper caudal dusky stripe extending to the tip, although the hairs here are only dusky at their extremities, the principal portion being white; in some specimens entirely white, the lower stripe becoming obsolete near the tip.

Two specimens of what I refer to this species were caught at Posa creek by Dr. Heermann and preserved. They are in the state of moult or change of hair, and it is consequently impossible to describe accurately their color. The essential conditions of the species appear to consist in a thin tail, much longer than the body, the hairs quite close pressed till on the terminal third, when they gradually elongate on the upper side to the tip, where they measure an inch in length. They elongate somewhat on the under side near the tip, but do not stand out in a crest as on the upper.

The general distribution of color is much as in *D. ordii* and other species of the genus; upper parts yellowish brown, with a little dusky intermixed; lighter on the sides. Sides of snout, spot above the eye behind the ear, a stripe crossing the groin from the belly to the base of the tail, fore legs, tarsi and feet, with the under parts generally, pure white. Tail white, with a smoke-brown stripe on the upper side from near the white base to the tip of the tail, and another on the lower side nearly to the tip, where it becomes obsolete. On the terminal third of the tail, however, the dark marking is confined more and more to the tips of the hairs, and at its extremity the general impression is that of a white tuft.

A specimen from Los Angeles, No. 41, is in more mature condition. In this the head is narrower than in *D. ordii*, and with somewhat the same ground color, has this more relieved by dusky tips to the hairs on the head and back. It agrees in locality with the *D. agilis* of Gambel.

I am very far from satisfied that this species, as described above, is really distinct from what I call *D. agilis*, as the characters seem to me too intangible to distinguish them. There are various shades of gradation in the colors of the terminal portion of the tails. Generally the dusky inferior stripe runs out about an inch from the end of the vertebræ, leaving the end of the tail white, with only a tinge of plumbeous on the upper surface and tip, the basal and larger portion being white. Sometimes, however, the prevailing impression is plumbeous instead of white.

Two specimens—one from California, precise locality unknown, the other from Fort Reading—have the entire tip of the tail, all round, for about half an inch before the end of the vertebræ, well defined white, without any plumbeous. Just before the white tip the tail appears to be plumbeous all round. In the Fort Reading specimen the tail is unusually long; in the other it is only moderately so. The colors of these specimens are quite dark, more like the *D. agilis*, as described.

List of specimens.

Catalogue number.	Corresp'ing No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—	
								Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.		
2628 ¹			Southern California ....	.....	J. G. Bell.....	.....	Skin, in alc.	.....	.....	.....	.....	6.10	6.97	.50	1.60	.....	
41 ²	943	♀	Los Angeles, Cal.	July 21, 1847	Wm. Hutton.....	.....	Skin.....	.....	.....	.....	.....	4.25	5.75	.....	.50	1.54	.....
1679 ³			Los Angeles, or Monterey	.....	Lt. W. P. Trowbridge..	.....	do.....	.97	1.60	4.12	6.50	7.12	.....	.....	1.63	.....	.....
472 ⁴			Posa creek, Cal.	1853.....	Lt. R. S. Williamson...	.....	Mounted ..	.....	.....	.....	4.67	7.25	8.25	.....	1.55	Dr. Heermann..	.....
473 ⁴			do.....	1853.....	.....	.....	do.....	.....	.....	.....	4.92	6.1	.....	.....	1.55	do.....	.....
2626 ¹			Fort Reading, Cal. ....	.....	Dr. J. F. Hammond ...	.....	In alc.....	.80	1.25	1.40	3.25	6.10	.....	.45	1.60	.....	.....
2627 ³			do.....	.....	do.....	.....	do.....	.89	1.33	1.53	3.35	5.83	.....	.49	1.60	.....	.....
995 ⁴			Fort Walla Walla, O. T.	1854.....	Dr. Geo. Suckley	51	Skin.....	.....	.....	.....	.....	5.75	6.62	.....	1.50	.....	.....

¹ Hairs at tip of tail pure white.

² Hairs at tip of tail white at base, with dusky tips.

³ Terminal brush pulled off.

⁴ Very similar to 472 and 473.

DIPODOMYS AGILIS, Gambel.

Dipodomys agilis, GAMBEL, Pr. A. N. Sc. Phila. IV, Aug. 1848, 77. (Los Angeles.)

LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 224.

AUD. & BACH. N. Am. Quad. III, 1854, 339.

BAIRD, Pr. A. N. Sc. Phila. VII, 1855, 334. (San Diego.)

SP. CH.—Above dusky, with but a slight tint of yellowish brown on the sides. Tail much longer than the body; slender; only a moderate crest of erect hairs towards the tip visible on both upper and under surfaces. The terminal fourth or fifth of the tail uniform dusky, and the dusky stripe on the lower surface extending to the end without interruption.

In this species the body appears stouter than that of *D. phillipii*. The ears are large, with the posterior half of the exterior surface sparsely coated with hairs; the antitragus is as fully developed as in *D. phillipii*. The tail is slender, and much longer than the body, the hairs on the upper surface beginning to elongate about the middle, and maintaining an average length of about one-third of an inch to near the tip, where they become rather longer. At about the terminal fifth of the tail the hairs on the under surface elongate, and are quite symmetrical in length and angle of insertion with those above them.

The prevailing colors are, on the back and sides, ashy brown, with the sides anterior to the groin tinged with yellowish brown, and a fine pencilling of the same on the shoulders and top of the head. The under parts generally, side of snout, spot above the orbit and behind the ear, with the feet and a stripe from the abdomen across the thighs to the root of the tail, white. The posterior face of the hind leg, from the hams to the toes, sooty brown. Tail dark brown, with a white stripe from the base to about the terminal fourth, which is quite uniformly dusky. None of these dark hairs have appreciably lighter bases.

The hairs on the upper parts of the body are lead color, the tint becoming a little darker to the terminal pale tips. On the flanks the hairs with the yellowish brown tips are white at the base only along the line of junction, instead of having this character prevail for a considerable distance up the sides.

This species differs from *D. phillipii* in the stouter body, broader ears, shorter and less bushy tail, much darker tints on the body, and the uniform dark colors of the terminal fourth of the tail. The tail is longer and the colors darker than in *D. ordii*, which, besides, is without the uniform dark tip.

A specimen from San Diego, (1062,) with the characteristics of the species described above, has the hairs at the end of the tail longer and fuller, and, when examined closely, they present a little whitish at the base, instead of being uniform plumbeous to the root.

In the impossibility of settling the question without further materials, I have not thought it best, as yet, to combine all the long-tailed *Dipodomys* from the Pacific slope into one, but have not much doubt that such course will be authorized hereafter. The colors of body and tail vary very considerably at any rate; and to continue the construction of species on the same data as guided Dr. Leconte and myself two or three years ago, would now necessitate the establishment of half a dozen new ones, to accommodate the present large collection belonging to the Smithsonian Institution. That we certainly have two very good and distinct species, the first extending along the Rocky Mountains, from the Platte, to about latitude 26, in Coahuila; the other from the Columbia river to San Diego, Fort Yuma, and, possibly, to Real del Monte, Mexico,

cannot be questioned. Although by no means certain that the true *D. phillipii* of Gray is the California one, it is yet highly probable.

If there be but two North American species, they would be readily characterized, independently of color, as follows:

Dipodomys ordii. Tail vertebræ, about $1\frac{1}{2}$ times the length of the head and body; rarely exceeding 5 inches, never $5\frac{1}{4}$. Hind feet moderate, not exceeding 1.50 inches, or about one-third the length of the body.

Dipodomys phillipii. Tail vertebræ about $1\frac{3}{4}$ times the length of the head and body; always exceeding $5\frac{1}{4}$ inches, usually from 6 to 7 inches. Hind feet larger, usually exceeding 1.60 inches, or more than one-third the length of the body.

There would then remain, as generic characters, the yellowish brown to dusky brown back, the white belly, white line across the thighs, the dark stripes on the upper and under surface of the tail, with the intervening white lateral one on either side. The dusky line under the hind foot is also common to both.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.										Collected by—	
						Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Width of skull.		Height of ear.
2625			San Francisco, Cal.....	Lt. W. P. Trowbridge..	In alc.	.86	1.43	1.56	3.98	6.30	.....	.50	1.68	.....	.....	.....	.....
489	1630	.....	San Diego or Monterey.	do.....	Skin .....	.....	.....	1.50	4.33	5.67	6.17	.....	1.50	1.39	.88	.50	.....
1062			San Diego, Cal.....	do.....	..do.....	.....	.....	.....	5.00	6.12	7.00	.....	1.50	.....	.....	.....	A. Cassidy
1063			do.....	do.....	..do.....	.....	.....	.....	4.41	5.33	5.70	.....	1.48	.....	.....	.....	.....do.....
1348		○	Fort Yuma, Cal.....	Major W. H. Emory ...	In alc.	.55	.85	1.03	.....	2.65	.....	.36	1.10	.....	.....	.....	A. Schott.....
?2624		○	do.....	do.....	..do.....	.....	.....	.....	.....	.....	.....	.40	1.40	.....	.....	.....	.....do.....
2622		○	do.....	Major G. H. Thomas...	..do.....	.56	.90	1.07	2.20	2.93	3.25	.33	1.15	.....	.....	.....	.....do.....

The following species of *Dipodomys*, indicated very briefly by Dr. Leconte, I know nothing of.

DIPODOMYS HEERMANNII, Leconte, Pr. A. N. Sc. Phil. VI, April, 1853, 224.

Tail as long as the head and body; hair at the tip scarcely longer; antitragus very short, indistinct. Tail brown, becoming black towards the extremity, with a broad white vitta on each side; tip, pure black. Specimen not quite adult. Sierra Nevada, collected by Dr. Heermann.

DIPODOMYS WAGNERI, Leconte, Ib.

Based on a specimen in the Philadelphia Academy, labelled "James Reed, South Carolina." As no species are known east of the eastern base of the Rocky Mountains, this is probably an error, if intended to indicate a locality. Supposed to belong to the division with tail much longer than the head and body. Agrees in color with *D. agilis*. Ears larger, antitragus large, broad, and obtusely rounded at its summit. Outer portion of tail wanting.

PEROGNATHUS, Maxim.

Perognathus, PRINCE MAXIM. NOVA ACTA ACAD. C. L. C. XIX, 1, 1839, 369.

Cricetodipus, PEALE, MAMMALIA AND BIRDS, U. S. EX. EX. 1848, 52.

Incisors with a longitudinal groove down their anterior surface. Molars rooted; tuberculated in the young, in the adult with the crowns plane. The auditory bullae are much developed, and project behind slightly beyond the plane of the occipital bone; the zygoma is slender and low.

The thumb and great toe are quite rudimentary; the former with a rounded nail, the latter with a short claw. The remaining four digits are nearly equal; the claws on the fore feet longer than behind. The soles and palms are sometimes naked, sometimes hairy posteriorly. The tail is as long as the body, and covered with short hair; thinly so in the young.

The external cheek pouches open amply, the slit extending from the angle of the mouth nearly to the scapula. The ears are small; in some species the antitragus is developed as a small rounded projecting lobe.

The skull of *Perognathus* agrees in many respects very closely with that of *Dipodomys*. Thus, there is the same elongated muzzle and its semi-tubular projection beyond the incisors; a similar development of the temporal bone; the thread-like malar; a similar palate, incisive foramina, aperture in the side of the muzzle, grooved upper incisors, and their curvature and pressing outward of their walls, &c. There still remain important points of distinction, however, by which the two may readily be distinguished.

The skull is considerably depressed and flattened above; its greatest height more than two thirds its width, and its width between the temporal bones just half the length. The nasal bones are elongated; linear behind and in connexion with the upper edges of the processes from the intermaxillary, project beyond the incisors, as a short tube, open below. This tube, however, is shorter and more open than in *Dipodomys*. The parietal bones are five-sided. The interparietal is also somewhat five-sided and much developed; much broader than long, and largely in contact anteriorly with the parietals, but embraced laterally by narrow branches from the occipital, which pass forward and connect by an acute point with the parietals. In *Dipodomys* this interparietal is very small, narrow, and longitudinal, in contact with a very small portion of the parietal, which is more or less three-sided.

The temporal bone, though highly developed, is smaller than in *Dipodomys*. While it enters largely into the occipital surface (which is quite plane) it is confined to the sides of the occiput, the occipital having more prominence than in *Dipodomys*, and coming into the plane of the back of the head. The mastoid portion is less developed in front, the meatus auditorius being tubular anteriorly, with a projecting rim, instead of being a mere hole in the middle of a bone, without any raised margin. The petrous bones come far forward, but scarcely overlap the sphenoid and abut as in *Dipodomys*. The linear opening between the petrous bone and the base occipital in *Dipodomys* is closed.

The upper face of the zygomatic process of the maxillary is not produced backward as a thin plate over the orbital cavity, but is much as in ordinary rodents. There is no ante-orbital foramen in the base of the zygomatic process or a little anterior to it; this being, as in *Dipodomys*, replaced by a large rounded aperture in the side wall of the snout, opening directly into the nasal cavity.

The lower jaw is shaped much like that of *Dipodomys*, with a similar outward twist of the upper end of the postero-inferior angle. The coronoid process is also outside of the plane of the condyloid. The tubercle indicating the posterior extremity of the incisor, instead of

appearing between the condyloid process and the lower angle, makes its appearance quite prominently outside of the bottom of the notch separating the condyloid and coronoid processes.

The molars are all rooted throughout life. Each one, as far as can be judged, has four roots; at least this is the case with the second and third. The molars are slightly convergent anteriorly, their inner lines being straight. In the unworn teeth the crowns are uniformly studded with distinct regular tubercles. In the upper jaw the first molar has four such tubercles, one anterior, one posterior, and one on each side. The second and third molars have two series of tubercles, exactly transverse to the crown, each series consisting of three tubercles of nearly equal size, separated by a transverse valley. A similar arrangement may be seen in the last molar, but in consequence of its diminished size the tubercles become indistinct. The same conditions prevail in the lower jaw, except that the four tubercles of the anterior molar are arranged two anterior and two posterior, and the outer tubercles of the rest are rather low; indeed, not more than four can distinctly be discerned in the posterior molar. The last molars of both jaws are less than the second and third, which are nearly equal. The first molar is larger than the fourth; in the upper jaw it is nearly equal to the second; in the lower it is decidedly less.

The worn teeth, however, present entirely a different appearance, resembling more closely those of *Dipodomys*. The tubercles are ground off, leaving two parallel narrow islands of dentine enclosed by enamel, the centre of the tooth being thus traversed transversely by enamel, which is obscurely divided into two lines by a faint channel, the bottom of the transverse valley between the tubercles already mentioned. Still further wearing would remove this partition, throwing the whole dentine into a single island; of this condition, however, I have not seen specimens. The deciduous premolars do not differ materially.

In the following table I have endeavored to show the points in which *Perognathus* and *Dipodomys* differ from each other, as well as from most other genera of Rodents.

	<i>Dipodomys.</i>	<i>Perognathus.</i>
1. Height of skull.....	One-half the width.....	Two-thirds the width.
2. Width of skull.....	Two-thirds the length.....	One-half the length.
3. Parietal bone.....	Subtriangular.....	Subpentangular.
4. Interparietal.....	Small; elongated longitudinally.....	Larger; elongated transversely.
5. Occipital bone.....	Not entering into the plane of the occiput.	Forming part of the plane of occiput.
6. Occiput.....	Deeply emarginated behind.....	Nearly plane.
7. Pit between last lower molar and coronoid process.....	Present.....	Absent.
8. Molars.....	Rootless; transverse ridges continuous...	Rooted; transverse ridges tuberculated.
9. Tail.....	Very long.....	Moderate.
10. Under surface of soles to the toes.	Densely hairy.....	Naked or sparsely hairy.

There appear to be two quite distinct groups in this genus, one having the original *P. fasciatus* for its type, the other probably including the *Cricetodipus parvus* of Peale. They may be characterized as follows:

Perognathus.—Ears rather large; a distinct sub-orbicular lobe to the antitragus. Soles naked from the heel. Tail quite densely hairy, sometimes tufted at the tip.

Cricetodipus.—Smaller. Ears small, without any lobe to the antitragus. Soles covered with short hairs on the posterior half. Tail rather scantily haired; not tufted at tip.

The species may be arranged under these divisions as follows:

PEROGNATHUS.

A. Tail crested above at the end.

1. Sides without a lateral fulvous stripe. Size that of *Hesperomys leucopus*..... *penicillatus*.

B. Tail simple. Sides with a fulvous stripe.

2. Larger than *H. leucopus*. Ears large. Above, sandy yellow. Outside of fore legs and upper surface of feet white..... *fasciatus*.
 3. Size of *H. leucopus*, or less. Ears small. Hairs very rigid. Above, mixed cinnamon and black. Outside of both fore and hind legs, with the upper surfaces of the feet, white..... *hispidus*.
 4. Rather smaller than the preceding. Ears small. Above, cinnamon and black. Lateral stripe indistinct; outside of both fore and hind legs like the back..... *monticola*.

CRICETODIPUS.

5. Tail not longer, if as long, as the head and body. Hind foot about one-fourth as long as head and body..... *flavus*.
 6. Tail longer than the head and body. Hind foot more than one-third as long as head and body..... *parvus*.

The species of *Perognathus* have thus far been found from the lower Rio Grande of Texas to Fort Union, Neb., and westward to the Pacific ocean.

PEROGNATHUS PENICILLATUS, Woodhouse.

Perognathus penicillatus, WOODHOUSE, Pr. A. N. Sc. Phila. VI, Dec. 1852, 200.—*Id.* In Sitgreaves' Expl. Zúñi & Colorado, 1853, 49; plate iii, mammals.

AUD. & BACH. N. Am. Quad. III, 1854, 298.

SP. CH.—Larger than *Hesperomys leucopus*. Ears rather large; antitragus lobed. Tail longer than the body; upper side with a penicillated crest at the extremity. Feet large; soles naked. Color above yellowish brown. Under parts of body, hind feet, and entire fore legs to shoulder, white. Tail brown, whitish beneath to within an inch of the end; no fulvous lines on the sides.

This species is among the largest of the genus, and in many of its characters approaches closely to *Dipodomys*. It is about the size of *Hesperomys leucopus*, or larger. The head is broad, depressed, and acute. The muzzle is not cleft beneath, and is densely hairy everywhere, except on the septum and inner margin of the nostrils. The openings of the external cheek pouches are shorter than in *P. fasciatus*. The whiskers are very long, some of them reaching to the middle of the body. The ears are large for the genus, thin, and sparsely coated with hair; larger and less hairy than in *P. fasciatus*. The antitragus is very distinct as a small rounded lobe. The opening of the ear is covered by a tuft of stiff bristly hairs. The fur is remarkably coarse and stiff, without any short wool or fur mixed with the longer hairs. The

tail is considerably longer than the body, thick at base and tapering gently to the tip; it is everywhere covered densely with stiff appressed hairs; those on the upper side commencing to elongate at about the middle, and soon attain a length of half an inch, standing up obliquely, like a crest, towards the end of the tail, which is terminated by a condensed brush. The feet are rather large; the nail on the rudimentary thumb very small; the third claw longest; the first a little shorter; the second reaching to the middle of the third; the fifth to the middle of the second; the claws of the hand are considerably larger than on the foot. The short first toe reaches to the base of the second toe; the third toe is longest; the second and fourth equal and a little shorter; the end of the fifth claw extends as far as the antepenultimate joint of the fourth toe. The soles are entirely naked from the heel, with a few scattered hairs along the sides, and covered with a pavement of depressed scale-like tubercles.

The upper parts generally are of a dull light yellowish brown or tawney, lined with dark brown, paler on the sides. The hairs have a lustrous tint of fresh cut lead for about two-thirds from the base, becoming a little darker outwards; they then assume the dull yellowish brown as described, and a considerable number are finally tipped with dark brown. Beneath, and on the lower part of the sides, the entire fore leg and the hind foot are dirty white. The line of separation on the sides passes nearly straight along the sides from the cheeks. The ears are dusky, without an appreciably lighter margin. The tail is dull white below, to within about half an inch of the end of the vertebræ; from which point, with the entire upper side to the tip, it is dark hair-brown.

This species is readily distinguished from *P. monticola* by its larger size; larger and more naked ears; much longer and penicillated tail; larger feet; shorter pouch openings; lighter color, and the color of the back not dipping down on the arm at all, instead of extending in a lighter shade to the wrist. It is without the yellow lateral stripe of *P. fasciatus*. It is not improbable that the specimen caught on King's River, California, by Dr. Heermann, and referred by me to *P. parvus*, of Peale, may prove to be a very young specimen of this species, as they agree in the large feet, &c. *Perognathus flavus* is distinguished by the brighter color, shorter feet and tail, which is not penicillated, and other characters.

The preceding description was taken from Dr. Woodhouse's specimen. Since then several specimens collected on the Colorado have been received, all agreeing remarkably in characters with the first mentioned. The colors of the under parts are better defined, however, the white of the cheeks extending a short distance below the eye, and involving the entire side and extreme tip of the muzzle. The extreme tip of the tail all round is plumbeous.

List of specimens.

Catalogue number.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.										Collected by—	
						Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore ft.	Length of hind ft.	Longest fore claw.	Longest hind claw.		Height ear above notch.
2676	San Francisco Mts., N. M.	1851.....	Capt. L. Sitgreaves...	....	Mounted.....	.....	.92.....	.....	4.12	4.50	5.08	.40	.96	.13	.12	.30	Dr. S. W. Woodhouse.
1332	Colorado river, Cal. . .	Feb. 22, 1855	Maj. W. H. Emory . . .	5	Skin.....	.....	.....	.....	3.45	3.00	3.62	.....	.91	.....	.....	.....	A. Schott.....
1333	Near Fort Yuma, Cal. . .	.....	.....do.....	3	do.....	.....	.....	.....	4.25	3.65	4.15	.39	.95	.....	.....	.30	do.....
1349	Colorado desert, Cal. . .	.....	.....do.....	.....	In alc.....	.50	.90	1.00	2.50	3.15	.....	.34	.75	.....	.....	.....	do.....

PEROGNATHUS FASCIATUS, Pr. Max.

Perognathus fasciatus, PR. MAX, Nova Acta C. L. C. Acad. XIX, 1, 1839, 369; tab. xxxiv.—IB. Reise innere Nord-Amerika, I, 1839, 449.

WAGNER, Wiegmann's Archiv, 1841, II, 45.—IB. Suppl. Schreb. III, 1843, 612.

LECONTE, Pr. A. N. Sc. Phil. 1853, 224.

AUD. and BACH. N. Am. Quad., III, 1854, 341.

SP. CH.—Considerably larger than the house mouse. Tail as long as the body without the head. Antitragus conspicuously lobed. Soles naked. Above reddish yellow, closely lined with black; fore legs all round, feet, and under parts white; a pale reddish yellow immaculate band on each side.

This animal is perhaps the largest of the genus, and if all the specimens referred to it are of the same species, has a very extensive range. The specimen before me (1061) is about the size of *Tamias quadrivittatus*, or about as long as the larger meadow mice, (*Arvicola*,) but more slender. The cheek pouch-openings are large, reaching further back than the lower jaw. The ears are larger than usual in *Perognathus*, projecting prominently; the antitragus exhibits a conspicuous narrow elongated lobe. The concavity of the ear is thinly haired, the outside is more densely coated.

The thumb is short but distinct, armed with a flat nail. The fore claws are a little longer than the hinder ones. The hind feet are moderately long; the soles naked along the central line from the heel. The tail is about as long as the body, exclusive of the head. It is thickly coated with rather long, stiff hairs, concealing the annuli; the terminal hairs but little longer; the hairs on the upper surface of the terminal half, however, are rather longest, especially over the joints.

The hair is everywhere stiff, harsh, and lustrous, not very close set, and much like fine spun glass; there is no under fur whatever.

The back and upper parts of the sides are of a light yellowish sandy, finely and uniformly lined with dark brown or black; the individual hairs are of the color of recently cut lead for the basal three-fifths, then pale reddish yellow, and narrowly tipped with black. The under parts and inside of the limbs, including the whole fore legs, the feet, and the sides of the muzzle, are white; on each side of the belly a broad distinct stripe of pale reddish yellow, commencing a little before the eye on the side of the upper jaw, and, passing across the shoulder, extends as far as the heel on the outer or anterior face of the hind leg, the exterior face of which is otherwise, colored like the back. The region immediately around the eye is reddish yellow; separated in a measure from the yellow of the lower part of the cheeks by hairs largely tipped with black. There is no plumbeous at the bases of the hairs on the belly, or in the yellowish lateral stripe. The tail is white, with the exception of an indistinct dusky stripe on the face.

Although the locality of this specimen is widely remote from that described by Prince Maximilian, (Chihuahua city, and the mouth of the Yellowstone,) I am unable to detect any differences in any respect. His is smaller, but the skull and teeth figured evidently belong to quite a young animal, as the tubercles of the molars are not yet ground off, which takes place in quite early life.

No mention is made of the lobe of the antitragus, but this might readily be overlooked; the naked soles are distinctly indicated in the diagnosis of the genus.

A skin in the collection of the Philadelphia Academy, collected at Fort Riley, Kansas, by Dr. Hammond, agrees very well with this specimen, and with the description of Maximilian.

In this the lobed antitragus is very distinct; the soles naked. The hind legs, perhaps, have less of the dorsal color on their exterior. The size appears considerably larger, but the specimen was probably somewhat over stuffed.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.	Measurements.				
				Nose to end of—		Length of—		Ear, from notch.
				Tail.	Verteb.	Fore ft.	Hind ft.	
1061	Chihuahua city.	John Potts	Skin.....	4. 50	3. 87	. 45	1. 02	. 40

PEROGNATHUS HISPIDUS, Baird.

SP. CH.—Ears small, not projecting beyond the fur; antitragus with a distinct lobe. Soles naked. Hair very stiff and coarse. Tail as long as head (and body?). Above mixed cinnamon and black; sides with a fulvous stripe; beneath white. Entire fore and hind legs white.

This species is strongly marked even in the genus *Perognathus* by the very thick, coarse, stiff and bristly hair covering the whole of the body and limbs, and longer than usual. The ears are small, and do not project beyond the fur; the antitragus is distinctly lobed. The feet are very stout and broad, the soles naked from the heel. The tail is broken in one specimen, (577,) in another it is as long as the head and body. It is covered with rather long stiff hairs lying flat to the bone, and mostly concealing the whorls; those on the upper surface rather longer.

The upper parts are of a mixed cinnamon and black. The entire surface of the fore and hind legs all round with the under parts white; a fulvous band along the sides running out on the hind legs. The belly hairs are white to their roots.

Another specimen, (576,) probably of the same species, has been so discolored by long immersion in alcohol, as to render its tints unappreciable. It agrees, however, in general characters with No. 577.

This species is smaller than *P. fasciatus*, and differs in the longer and much stiffer hair, smaller ears, the light colored thighs, and the darker color. It has not the pencilled tail of *P. penicillatus*; compared with *P. monticola*, it is larger, with stouter feet, and the outsides of the arm and thighs are white, instead of being colored like the back. The belly hairs are white to the roots, instead of being plumbeous at the base.

The penis of the male of this species is armed with a spiculum of bone half an inch long, perfectly straight and tapering to the end, where it is expanded, and the head is divided by a deep furrow.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										Collected by	
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.		Ear, from notch.
577 ¹	1696	♀	Charco Escondido, Mexico, (24 leagues W. of Matamoras)	1853	Lt. D. N. Couch....	Skin.	.....	.....	.....	2.84	2.30+	.....	.....	.85	.....	.57	.26	}
							.64	.93	1.33	3.12	2.42+	.....	.42	.84	.....	.....	.37	
576 ²	1695	♂	Matamoras, Mexico.....		do.....	do..	.....	.....	.....	3.25	3.62	.....	.36	.92	1.10	.57	.25	} Dr. Ber- landier.
							.67	1.00	1.33	3.50	3.60	3.80	.45	.92	.....	.....	.37	

¹ The second line of measurements contains such as were made before the animal was skinned. Width of head, .75; length of cheek pouches, .80; fore claw, .17; hind claw, .11; length of opening of cheek pouches, .55; depth of do., .67.
² The second line of measurements contains such as were made before the animal was skinned. Width of head, .75; length of cheek pouches, .80; fore claw, .17; hind claw, .11.

PEROGNATHUS MONTICOLA, Baird.

Sp. Cu.—Antitragus lobed; soles naked. About as large as the domestic mouse. Tail rather shorter than the head and body, fully coated with hair. Hind feet rather short. Color above mixed cinnamon and dusky; flanks scarcely clearer, beneath white; tail colored to correspond with these regions. Hairs below as well as above, plumbeous at base, those above exhibiting this color for nearly two-thirds their length. Outside of fore leg dusky to the wrist.

The specimen of this species, collected by Dr. Suckley, is about the size of a common mouse *Mus musculus*, to which it bears no inconsiderable resemblance, though readily distinguished by the grooved incisors, external cheek pouches, and small ears. The snout is acute and entirely hairy, except the septum and the inner margin of the nostrils. The whiskers are longer than the head, and principally white, though the longest are black at the base. The ears are moderate, not much larger than the orbit, subtriangular; the exterior face naked except on the posterior half; the margins and inner surfaces coated with short stiff hairs. The tail is about as long as the body, everywhere densely hairy without showing the murine scaly rings; there is a slight elongation of the hairs towards the tip. The claws of the fifth or outer fingers and toe reach to the bases of those of the fourth, respectively, next them.

The upper parts of body and sides with the outside of the arm and leg are of a mixed cinnamon and black, the individual hairs being clear plumbeous for nearly the basal two-thirds, then cinnamon with a slight tip of black; the belly is dull whitish, the boundary between the two constituted by a tint of clear whitish cinnamon. There is a considerable mixture of black hairs on the cheek and top of the head; though the orbital region and lower part of the cheeks are yellowish brown. The inner surface and margin of the ears are cinnamon; the hairy portion of the exterior with the inflexed portion dusky; the lighter margin showing very distinctly behind this. The feet are dull whitish, the lower part of the legs suffused with cinnamon. The upper part of the tail is like the back, the lower like the belly, and the sides have the same cinnamon tint of the flanks.

Skin mounted, from alcohol.

Measurement.	Inches.
Nose to eye	.46
ear	.92
occiput.....	1.08
root of tail	3.00
Tail, from root to end of vertebræ, (tip broken).....	2.67+
Ears, height posteriorly.....	.25
internally above notch	.25
width.....	.21
Arm, longest claw	.14
Leg, hind foot from heel to end of claws.....	.80
longest claw.....	.12
Skull, length	.98
width	.50

I unhesitatingly referred this animal to the *Perognathus fasciatus* of Maximilian, until the reception and examination of specimens more nearly allied to the latter. On a careful comparison, however, I find that the differences are sufficient to warrant a specific separation. The ears are much smaller—scarcely half the size—although distinctly lobed; the feet and tail perhaps longer in proportion. The upper parts are much darker; the sides lack the conspicuous pale stripe. The belly hairs are plumbeous at the base, instead of pure white; and the dark colors of the back extend on the outside of the fore leg to the wrist, instead of being pure white.

The skull, though about the size of that figured by Maximilian, is much more mature, the tubercles having disappeared entirely.

List of specimens.

Catal'gue number.	Correspondi'g No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
451	1585	♀	West of Rocky Mountains, St. Mary's. ?	1853.	Governor I. I. Stevens.	Mounted.	Dr. Geo. Suckley.

PEROGNATHUS FLAVUS, Baird.

Perognathus flavus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 332.

SP. CH.—Considerably less than the common mouse. Tail equal to or less than the head and body, scarcely different in color above and below. Hind feet short. Above, yellowish buff, with dusky tips to some of the hairs; clearer on the sides; Beneath, snowy white to the roots of the hairs. Fore leg white to the shoulders. Hairs on the back plumbeous only on their basal half.

This species is almost as diminutive as the *P. parvus* of Peale, although different in color and proportions. The ears are moderately large; the third claw of the hand longest; the fourth scarcely shorter; the second reaching to the middle of the third; the fifth extending

beyond the base of the fourth. The central three toes are nearly equal, the middle one longest; the fifth extending a little beyond the last articulation of the fourth toe. A few scattered hairs on the under side of the metatarsus. The tail is rather shorter than the body, sparsely coated with short hairs.

The prevailing color of the back and upper part of the sides is a yellowish buff, darkest on the back, and with the hairs finely tipped with brownish, clouding the buff; clear pale buff along the flanks. On the dorsal region the hairs are plumbeous at their basal half, and buff for the remainder, except on the dusky tip. Towards the sides, however, the buff extends towards the base of the hairs; reaching this on the line of junction of the belly. The hairs of the under parts are snowy white to the roots; the tail paler beneath. Fore leg entirely white.

This species is smaller than *P. monticola*; the tail is shorter and less hairy; the muzzle is shorter. The color above is lighter and less varied, and the lead-colored bases to the hairs less extensive, there being none on the sides and beneath. The color is paler than that of *P. parvus*; the size larger, the tail and feet shorter, &c.

The acquisition of several specimens in alcohol enables me to give the characters of this species, in respect to its external form, with greater precision than as based on the dried specimens. The head is rather broad and blunt, apparently shorter than in the domestic mouse. The eyes are rather minute, situated nearer the ear than the eye. The external ear is low, rounded oblong, its longest diameter in a line with the axis of the head. There is no lobe whatever on the antitragus, as in *P. penicillatus*. The ear is sparsely coated with hairs on both surfaces, most scattered on the concavity. The muzzle is coated with coarse stiff hairs to the very extremity all round; the septum and region immediately around the nostrils being alone naked; these hairs on the sides and lower part of the muzzle are long, and spring out like short fine whiskers. These are long and black, and situated in five rows. The cheek pouches are readily capable of eversion, their lining coated with short white hairs. The fore claws are rather the longer, the thumb short, though perfectly distinct, and armed with a flat nail. The soles are paved from the heel, but are rather thickly studded with short white hairs to near the end of the metatarsi. The first toe is very short and set far back, its claw only reaching to the base of the second toe; the central three toes are longest, the middle one exceeding the others; the fifth toe is situated posterior to these, and its claw reaches the penultimate articulation of the fourth. The tail is formed as in the mice, cylindrical, tapering to a rather blunt tip; it is covered with whorls of fine scales, with short hairs springing between them, but not obscuring the whorls; there is a short pencil of stiff hairs at the end. The tail, with the hairs, is about equal to the head and body in length, or barely less.

A specimen (2615) from the Upper Missouri is rather larger, and the prevailing colors above appear more slaty; the lower part of the sides yellow, or rather yellowish orange. This, however, is probably of not much importance, as there is a similar difference in specimens caught on the Mexican boundary line.

List of specimens.

Catalogue number.	Corresponding number of skulls.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—
								Tip of nose to eye.	Tip of nose to ear.	Tip of nose to occip.	Tip of nose to tail.	Tail to end of verteb.	Length of fore foot.	Length of hind foot.	Length of skull.	Ear above notch.	
2615	.....	.....	Between Milk & Maria rivers, Neb.	Sep. 4, 1853	Gov. I. I. Stevens....	.....	In alc....	.40	.75	.95	2.25	2.15	.30	.70	.....	.....	Dr. G. Suckley..
2614	.....	.....	Ree Fork, Neb.....	Sep. 24, 1856	Lieut. F. T. Bryan...	352	do....	.45	.80	.95	2.40	2.20	.30	.66	.....	.....	W. S. Wood....
1931	.....	○	Republican Fork, Neb..	Sep. 27, 1856	do.....	363	do....	.40	.70	.85	1.82	1.90	.28	.60	.....	.....	.....do.....
439	1304	.....	Grand White R., near Lit. Salt Lake, Utah.	1853.....	Capt. E. G. Beckwith.	6	Mounted	.....	.....	.....	.....	.....	.....	.....	.....	.....	Mr. Kreutzfeldt..
440	1305	.....	Rocky Mts., 38th par...	1853.....	do.....	.....	do....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
270	1665	.....	Cimarron Riv., (Sand Cr.,) N. M.	1853.....	John Potts.....	.....	Skin....	.42	.....	.83	2.17	2.00	.....	.60	.83	.25	.....
1043	.....	.....	San Antonio to El Paso, Texas.	1854.....	Maj. W. H. Emory....	.....	Alcohol..	.45	.73	.94	2.20	2.20	.30	.60	.....	.....	Dr. Kennerly...
1041	.....	.....	El Paso to Los Nogales, Sonora.	1855.....	do.....	.....	do....	.38	.70	.85	2.00	1.80	.35	.63	.....	.....	.....do.....
148	1130	.....	El Paso.....	1851.....	Col. J. D. Graham....	.....	Skin....	.....	.....	.....	2.00	2.04	.25	.62	.....	.....	J. H. Clark.....
2623	.....	.....	Chihuahua trip.....	.....	Dr. T. H. Webb.....	.....	In alc....	.40	.68	.85	1.85	1.60	.22	.58	.....	.....	.....
2613	.....	.....	Matamoras.....	.....	Lieut. D. N. Couch...	.....	do....	.45	.80	.95	2.15	2.40	.35	.63	.....	.....	Dr. Berlandier..

¹ Longest fore claw .11; longest hind claw .08.

PEROGNATHUS PARVUS.

Cricetodipus parvus, PEALE, Mamm. and Birds U. S. Ex. Ex. 1848, 53.*Perognathus parvus*, LECONTE, Pr. A. N. Sc. Phila. VI, Jan. 1853, 225. (His specimen may have belonged to *P. flavus*.)*Perognathus (Cricetodipus) parvus*, AUD. & BACH., N. Am. Quad. III, 1854, 328.

SP. CH.—Smallest known species of American rodent? Above, buff, mixed with dusky; beneath, white; entire fore leg white. Tail rather longer than the body. Hind foot from heel nearly as long as the head.

The single specimen collected of this species is not quite mature or perfect enough to admit of a satisfactory description. It exhibits, however, decided marks of difference from the other species examined, especially in the longer tail and hind feet, both of which exceed those of *P. flavus*. The auricle is without the lobe of the antitragus, and the sole is covered with scattered hairs, as in the latter species.

Measurements.

	Inches.
Nose to occiput	.75
to eye	.33
to ear	
to root of tail	1.83
Tail, from root to end of vertebræ, (broken)	2.25
from root to end of hairs	
Ears, height posteriorly	.23
height internally above notch	.20
Arm, longest claw	.12
Leg, hind foot from heel to end of claw	.70
longest claw	.11
Skull, length	.80

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Locality.	Whence obtained.	Original number.	Nature of specimen.	Collected by—
474	1603	King's river, Cal.	Lt. R. S. Williamson, U. S. A.	6	Mounted.	Dr. A. L. Heermann.

FAMILY.

MURIDAE.

Incisors $\frac{2}{2}$; molars $\frac{4}{3} \frac{4}{3}$ to $\frac{2}{2} \frac{2}{2}$, usually $\frac{3}{3} \frac{3}{3}$, rooted or rootless. A conspicuous opening in the zygomatic process of the upper jaw, which is generally a vertical slit widened above, but sometimes a rounded aperture, as in *Dipodinae*. The coronoid and condyloid processes and descending ramus distinct and well developed, situated nearly in the same plane; the latter more or less twisted. Tibia and fibula united below.

The *Muridae*, as above defined, are spread widely over the globe, and embrace more species than any other family of the *Rodentia*. None are of very large size, *Fiber*, among the largest, while the smallest quadrupeds known, next to the Shrews, are found here. Many of the species are cosmopolite, and accompany man in his migrations, and are capable of existing under almost the same extremes of climate and external conditions.

Exclusive of the *Dipodinae*, which are somewhat aberrant, and may possibly be differently placed with propriety, or even erected into a distinct family, the *Muridae* constitute a very natural group. Even the *Dipodinae*, however, agree in most essential points, a principal difference being in the large and rounded opening in the zygomatic process of the upper jaw. This, in all the others, consists of a narrow vertical fissure anterior to the corner of the frontal bone, widening above, and bounded externally by the zygomatic branch of the upper maxillary, which, instead of standing out more or less horizontally, is bent up, so that its anterior edge, at least, is almost in a vertical plane, and parallel with its fellow on the opposite side. In fact the zygomatic process is divided into three parts, one articulating behind with the malar bone, another completing the enclosure of the foramen just described, and a third articulating with the ante-orbital process of the frontal. The inferior narrow part of the ante-orbital foramen serves for the passage of the infra-orbital nerve; the wider upper portion, the outlet of which is directed upwards, accommodates a portion of the masseter muscle. The suture of the malar bone, with the zygomatic process of the upper maxillary, is distinctly visible; the bone itself does not extend to the frontal bone, although in some *Dipodinae* it reaches the lachrymal.

The three families into which the *Muridae* are divided, *Dipodinae*, *Murinae*, and *Arvicolinae*, have each their representatives in North America; their characters may be presented, briefly, as follows:

DIPODINAE.—Molars unequal, generally rooted. Ante-orbital foramen very large; rounded or oval; bounded externally in part by the malar. Hind legs greatly elongated.

MURINAE.—Molars rooted, unequal. Ante-orbital foramen a narrow slit expanding above, not bounded externally by the malar. Hind legs moderate.

ARVICOLINAE.—Molars rootless, very rarely with short roots; ante-orbital foramen as in the preceding. Hind legs short.

To these it will probably be necessary to add a fourth, to accommodate certain European genera, some of them of comparatively recent discovery, as *Ommatostergus*, *Spalax*, and *Chthonoergus*, which may be characterized as follows:

SPALACINAE.—Fore feet with five toes; the thumb short, but distinct, with a distinct nail. Soles covered by stiff long hairs directed outwards. Hind legs scarcely longer than the fore

ones, with five toes. Tail not prominent, or wanting. External ear wanting. Incisors broad and flat with the incisive edge rectilineal.

Of this remarkable group there are no species found as yet in America. It is distinguished from the *Murinae* and *Arvicolinae* by the distinct thumb, instead of this being a mere rudiment; the hind legs as short as the front ones, instead of being from one and a half to twice as long; in having the tail either wanting, or not projecting beyond the fur, instead of being decidedly longer; in having no external ear, and in having the anterior face of the incisors plane, with a straight cutting edge, instead of having it more or less rounded with a convex or curved cutting edge.¹

SUB-FAMILY DIPODINAE.

The characters of this sub-family, as given by Wagner, are found in the greatly elongated hind legs, fitted for taking long leaps; the abbreviated fore legs, the long hairy tail and the large infra-orbital foramen. Additional features may, however, readily be derived from the conditions of the skull, teeth, and other points of structure.

The incisors are considerably compressed laterally. The molars of opposite sides in each jaw are widely separated. Palatine portions of the intermaxillary, maxillary and palatine bones pretty much on the same plane. Incisive foramina and orbit large. Ante-orbital foramen very large, oval, as wide (or wider) below as above. The arch forming its outer border is not composed solely by the union of the upper and lower processes of the superior maxillary, as in the other divisions; but the malar is extended along the postero-external edge of the maxillary arch to the anterior corner of the orbit, where it is joined to the lachrymal. The zygomatic arches are long and slender, dipping below the level of the palate.

Not possessing any specimens of this family excepting species of *Jaculus*, I have been unable to define the general characteristics of the group more fully, especially as the two principal authors who have treated of the subject differ considerably in their views of its extent and features, and neither gave to it the limits which it now possesses. Thus, Wagner has included the genus *Dipodomys*, which belongs to an entirely different family. The genera of *Dipodinae* are, in fact, quite few; *Dipus*, or the Jerboa being the principal old world representative. The only North American genus is *Jaculus*, with a very limited number of species—perhaps but one.

¹For a very elaboratedisc ussion of this group, see Brandt, Beiträge zur Kenntniss der Säugethiere Russlands, 1855, pages 196—217.

JACULUS, Wagler.

Jaculus, WAGLER, Syst. Amph. 1830, 30.*Meriones*, AUD. and BACH. II, 1851, 251.

Upper incisors grooved longitudinally on their anterior face. Molars $\frac{4-4}{3-3}$, the upper anterior one very small. Hand with four fingers and a rudimentary thumb; foot with five toes. Hind legs and tail very long, the latter thinly haired.

It may be stated, among the generic characteristics of *Jaculus*, that the under surface of the hind foot from the heel is perfectly naked; smooth as far as the first tubercle, then granulated or paved. There is a distinct web at the bases of the toes. The antitragus is much developed, so as to constitute a thickened rounded valve capable of closing the meatus.

Further details of structure will be found under the head of *J. hudsonius*.

The principal characteristics of the skull have already been given under the head of the subfamily. The cranium is full and large; the muzzle long, especially the nasal bones, which project considerably beyond the incisors. There is also a sharp crest along the junction of the intermaxillaries, separating the incisors at their bases. The infra-orbital nerve is provided with a distinct foramen, which opens from a canal formed by a plate of bone, which, starting as a ridge, running along the alveoli, widens anteriorly, and, bending over, cuts off this passage way from the great ante-orbital foramen, which gives passage to the masseter muscle. The incisive foramina are very large, situated half in the maxillary, half in the intermaxillary bones, extending backwards as far as the second molars; the septum dividing them much swollen anteriorly. The palatine bone has two foramina, situated just behind the palato-maxillary suture, both entirely in the palatine bone. The auditory bullae are quite small, and have their longer axis nearly transverse to the longitudinal axis of the skull, (much more so than in the rats.) The petrosal bone appears quite loosely implanted in the cranium. The zygomatic arch is very broad anteriorly, and perforated by a large foramen, as described. Its lower edge is on a level with the crowns of the molars, even below the palate; it becomes very thin in its horizontal portion. The malar bone is of great extent, reaching along the whole zygoma from the lachrymal bone anteriorly almost to the auditory bullae. The zygomatic process of the temporal bone is flattened and bent downwards so as to be nearly parallel to its fellow on the opposite side. The malar bone is attached along its lower edge. The posterior part of this process, forming the outer wall of the glenoid cavity, is distinctly notched.

The anterior or first upper molar is very small, with a single root. The remaining three decrease rapidly in size from before backwards. The crowns in the specimen examined are broad and very much worn; there is an exterior line of enamel, with three or four islands in each. The two anterior lower molars are very large and nearly of equal size; the third is small, about the size of the last upper molar, and only half as long as those anterior to it. The lower molars are similar in proportions to the upper; the small anterior one wanting.

The incisors are slender and much compressed; colored dark orange. The upper ones have the outer half of the anterior face rabbetted down below the level of the inner half, with the corners rounded off; viewed laterally, therefore, the groove is very distinctly visible.

The tibia and fibula are united; there is a distinct cœcum, measuring in *J. labradorius* an inch and a half. In this species, also, the vertebral formula is: cervical, 7; dorsal and lumbar, 19; sacral, 4; caudal, 29. The clavicle is quite large.

This genus is distinguished from *Dipus*, among other characters, by having five toes on the hind feet, (each with separate metatarsus?) instead of but three articulated to a single consolidated metatarsal bone. The tail in *Dipus* is densely hairy. The upper molars of *Dipus* are three instead of four. In *Sciurtes* the upper incisors are not grooved, and there are two or three metatarsal bones instead of five.

JACULUS HUDSONIUS.

Jumping Mouse.

- Dipus hudsonius*, ZIMMERMANN, Geographische Geschichte, II, 1780, 358, (based on Pennant's long-legged mouse of Hudson's Bay.)
 BODDAERT, Elenchus Animalium, I, 1784, 115, (from Zimm.)
 FISCHER, Synopsis, 1829, 340.
- Meriones hudsonius*, AUD. & BACH, N. Am. Quad. II, 1851, 251; pl. lxxxv.
- Mus longipes*, ("PALL.") ZIMMERMANN, Pennant's Arktische Zoologie, I, 1787, 131.
- Dipus canadensis*, DAVIES, Linn. Trans. IV, 1798, 155.
 SHAW, Gen. Zool. Mamm. II, 1801, 192; pl. clxi.
- Gerbillus canadensis*, DESM. Mamm. II, 1822, 321.
 HARLAN, F. Amer. 1825, 155.
 GRIFFITH, Cuv. V, 1827, 240.
 GODMAN, Am. N. H. II, 94.
- Dipus americanus*, BARTON, Am. Phil. Trans. IV, 1799, 115; plate.—*IB.* VI, 1809, 143.
- Jaculus americanus*, WAGLER, Syst. der Amphibien, 1830, 23.
- Meriones americanus*, DEKAY, N. Y. Zool. I, 1842, 70; plate xxiv, fig. 2.
- Mus labradorius*, JOS. SABINE, Zool. App. to Franklin's Narrative, 1823, 661.
- Gerbillus labradorius*, HARLAN, F. Am. 1825, 157.
 GODMAN, Am. N. H. II, 97.
- Meriones labradorius*, RICHARDSON, F. B. Am. I, 1829, 144; pl. vii.
 WAGNER, in Schreb. Säug. IV; pl. ccxxvi, B, (from Rich.)
 DAWSON, Ed. New Phil. Jour. N. S. III, 1856, 2.
- Jaculus labradorius*, WAGNER, Suppl. Schreb. III, 1843, 294.
 KENNICOTT, Mammals Illinois, Pat. Office Rep. Agricultural, for 1856, (1857), 95; pl. xi.
- Meriones microcephalus*, HARLAN, Pr. Zool. Soc. London, VII, 1839, 1, (Philadelphia.)
- Meriones acadicus*, DAWSON, Ed. New Phil. Jour. N. S. III, 1856, 2; plate i
- Labrador rat*, PENNANT, Hist. Quad. 1781, No. 295.—*IB.* Arctic Zoology, I, 1782, 132.

SP. CH.—Above, light yellowish brown; lined finely with black; entire sides yellowish rusty, sharply defined against the colors of the back and belly. Beneath, pure white; feet and under surface of tail, whitish. Body measuring 2.75 to 3.50 inches; tail, 4.50 to 6.00 inches; hind feet, 1.10 to 1.30 inches.

The head of this species is quite small in proportion to the body, which is thickest behind, in correspondence with the great development of the muscles of the hind legs. There is a very appreciable diminution in size from the rump to the head, without any constriction at the neck. The fur is coarse and stiff, owing to the development of bristly hairs among the softer fur; it is rather long and pressed flat to the body. The naked muffle is entirely on the under surface of the snout, the hairs extending around the very tip of the nose to the anterior surface, where it is separated sharply from the naked portion by a furrow. It appears as if the hairy skin could be drawn downwards so as completely to cover the nostrils. The nostrils are lateral, and separated by a very wide septum, indented by two furrows. The upper lip is scarcely cleft as far as the base of the incisors, and the space between the notch and the nose is hairy entirely.

The ears are moderately large, and differ from those of *Hesperomys* in the existence of a well developed and thickened antitragus in the form of a circular thickened pad, naked on the inside, and capable of being applied against the meatus, so as to close it entirely as in the shrews. The tragus itself, also, is unusually prominent, and doubtless aids in closing the ear. The eyes are small, situated nearly midway between the nose and the ear.

The feet and hands are all unusually large, the former especially so. The thumb is very rudimentary, covered by a broad truncated nail. The third and fourth fingers are longest. The hind feet are very long, exceeding the skull and the tibia. The first toe is small, and placed so far back that its claw only reaches the end of the metatarsal; the fifth claw reaches the penultimate articulation of the fourth toe. The second, third, and fourth toes are much the longest, the third slightly longest of all. The middle toes are as long as the hand, and half the distance from heel to end of metatarsals. The sole is entirely naked from the heel. There is a tubercle about midway between the heel and the end of the toes; one at the base of the first and the fifth, and another at the junction of the second and third, and third and fourth toes, making five in all. The four at the bases of the toes are small, conical, and not at all conspicuous. The sole to the first mentioned tubercle is quite smooth; beyond this it is covered by a pavement of granules, except on the toes, which are transversely scutellate. There is a decided palmation at the bases of the toes, especially between the third and fourth, where it extends to the penultimate articulation.

The tail is very long, almost twice the body and head. It is cylindrical, or tapering gently to an attenuated tip; it is covered with verticellate scales, with short hairs of equal length springing between the whorls and not concealing them at all. There is a very slight pencil at the end. (2593.)

This species varies somewhat in its tints, although the pattern remains much the same. A well defined area—bounded by lines commencing at the nostrils and proceeding backwards immediately under the eye and meatus, and along the sides of the back, slightly divergent to the rump, and then converging to the root of the tail—is of a light yellowish brown, much darkened by fine linings of black. Below this, on each side, and in strong contrast to it, is a broad stripe of nearly pure yellowish rusty, which involves the entire cheeks from the angle of the mouth, the whole exterior of the limbs to the wrist and heel, as well as the buttocks. On the middle of the side this is nearly as wide as the dorsal stripe at the same place. The under parts are pure white to the roots of the hairs; the feet hoary gray. The tail is whitish beneath; dusky above.

The colors vary in the lighter or darker tints of the sides, which sometimes have even an orange cast. Sometimes there is a development of black tips to hairs on the side, obscuring the colors, although the contrast to the back is always strongly marked.

In the examination of a large number of specimens, I find a great difference in size as well as in the proportions of the tail. As a general rule, however, specimens from the Rocky Mountains and the Pacific coast are much larger than eastern ones. I can at present distinguish no other differences of importance; and although, if they are the same, it would form rather an exception to the usual law of geographical distribution of our small rodents, I am not willing to establish a species on this ground alone.

I hardly think that the *Meriones acadicus* of Professor Dawson is distinct as a species, as I find among the specimens in the Smithsonian collection every gradation between types of his two supposed species, kindly lent by him for examination. The larger feet of the smaller

animal would be in strict accordance with the law of growth of mammals. As to the darker colors of his smaller animal, they resemble almost exactly one of our largest specimens, (536,) in which the fulvous of the sides is much obscured by black hairs.

I find nothing in Dr. Harlan's description of *Meriones microcephalus*, which seems to indicate a species different from the common one.

Differences in the size of the ear has been considered to indicate two species. It must be remembered, however, that a smaller specimen would naturally have a smaller ear; and I have not been able, in the extensive series before me, to realize any proportional differences in different specimens.

The following detailed measurement of a specimen in alcohol, from Pennsylvania, will show the difference in size between it and a large skin collected in the Rocky Mountains by Captain Beckwith:

Measurements.

	538 ¹ . Penn.	536 ² . Rocky Mts.	587. W. T.
Nose to occiput.....	.96	1.21	1.00
eye	.44	.42	.40
ear	.83	.96	.75
root of tail.....	2.92	4.04	3.08
end of outstretched hind legs.....	4.08	-----	4.04
Tail, from root to end of vertebræ	4.75	4.83	5.04
hairs.....	4.92	4.96	5.16
Ears, height posteriorly.....	.42	.38	.42
anteriorly	.42	-----	.40
internally above skull	.42	-----	.50
width	.33	-----	.38
Arm, length of fore arm	.60	-----	.83
fore foot to end of claws.....	.42	.50	.56
longest claw	.06	.12	-----
Leg, tibia	.96	-----	1.00
hind foot from heel to end of claw	1.17	1.33 +	1.13
longest claw	.08	.14	-----
Longest toe from end of metatarsi	.40	-----	-----

¹ Specimen in alcohol. ² Dry skin; somewhat defective.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—	
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Fore feet, length of.	Hind feet, length of.	Skull, length of.		Skull, width of.
2592			Halifax, Nova Scotia		J. W. Dawson; loan.	In alco.	.46	.80	1.03	2.75	5.05	.39	1.20			
*1			do.		do.	Mounted.				3.75	5.50	.45	1.25			
*1		○	do.		do.	do.										
*2			do.		do.	do.				2.35	4.12	.38	1.16			
2593			Middleboro', Mass.		J. W. P. Jenks.	In alco.	.42	.75	1.00	2.90	5.20		1.18			
2595			do.		do.	do.	.45	.90	1.02	2.96	4.95	.37	1.20			
2596			do.		do.	do.	.42	.80	.97	2.75	4.53	.45	1.18			
2597			do.		do.	do.	.40	.80	.93	2.95	5.30					
2598			do.		do.	do.	.43	.83	1.00	2.74	4.80	.30	1.15			
869			do.	July 13, 1855	do.	Skin.				2.83			1.13			
2594			Burlington, Vermont.		Prof. Thompson	In alco.	.45	.90	1.00	3.30	5.35	.40	1.18			
2599			Wethersfield, Conn.		Charles Wright.	do.	.45	.90	1.02	2.75	4.80	.39	1.15			
2600			do.		do.	do.	.43	.81	1.00		4.36		1.10			
2605			Waterville, New York.		H. Davis.	do.	.45	.90	1.10	3.10	4.95	.45	1.17			
2606			do.		do.	do.	.49	.93	1.01	3.26	5.04					
2607			do.		do.	do.	.44	.87	1.00	2.84	4.90	.41	1.17			
2608			do.		do.	do.	.45	.90	1.02	2.95	5.03	.40	1.18			
1373			Raynor Beach, L. I.		Wm. Cooper.	Skin				2.70	4.25		1.13			
1372			New Jersey?		do.	do.				4.20	4.62	.40				
2604			Philadelphia.		J. H. Richard.	In alco.	.43	.86	1.00	2.90	4.64	.45	1.13			
558 1684	♂		Upper Darby, Penn.		Del. Co. Institute.	Skin				3.09	4.00	.40	1.10			
115		○	do.		do.	do.				2.35	4.10		1.11			
116		○	do.		do.	do.				2.25	4.12	.40	1.07			
2601			Carlisle, Penn.		S. F. Baird	In alco.	.43	.86	1.00	2.87	4.50	.45	1.15			
2602			do.		do.	do.	.43	.86	1.00	2.88	4.77	.40	1.15			
2603			do.		do.	do.	.40	.80	.95	2.60	4.40	.40	1.05			
721			do.		do.	Skeleton.								.92	.44	
2170			Williamsport, Penn.		J. McMinn	Skin.				3.88	4.45	.41	1.13			
826			Racine, Wisconsin	1853	Dr. P. R. Hoy.	do.				2.80	5.00	.40	1.18			
2611			West Northfield, Ill.		R. Kennicott	In alco.	.40	.80	.90	2.80	4.70	.40	1.10			
2612			Cass county, Missouri.		Dr. Hoy	do.										
2610			Upper Missouri.	1855	Dr. F. V. Hayden.	do.	.50	1.00	1.14	3.05	5.10	.48	1.15			
1778			Fort Union, Nebraska.	July 18, 1856	Lt. G. K. Warren.	Skin.				2.50	3.40	.40	.99			Dr. F. V. Hayden.
1929	♂		Platte river, Nebraska.	July 17, 1856	Lt. F. T. Bryan.	In alco.	.40	.78	.92	2.25	4.50	.47	1.12			W. S. Wood.
536 1677			R. Mountains, 38° par.		Capt. E. G. Beckwith.	Skin				4.70	.40					Mr. Kreutzfeldt.
2609			Steilacoom, Wash. Ter.		Dr. G. Suckley.	Alcohol.	.46	.98		6.10		.50	1.34			
915 1966	♂		do.		do.	Skin				3.02	5.05	.42	1.22	.95	.46	
*587 1710	♂		Washington Territory.		I. I. Stevens	do.				3.10	5.00	.40	1.13	.92	.49	Dr. J. G. Cooper.
809			Astoria.		Lt. W. P. Trowbridge	do.				5.50			1.29			
1267 2218			Canoe Creek, Cal.	Sept., 1855	Lt. Williamson.	Mounted.				3.48	5.25		1.22	.93	.49	Dr. J. S. Newberry.

1 Type of *Meriones labradorius*, Dawson.2 Type of *M. acadicus*, Dawson.

3 The measurement of this specimen before skinning, previously given.

SUB-FAMILY MURINAE.

Incisors compressed laterally. Molars $\frac{3-3}{3-3}$ or $\frac{2}{2} \frac{2}{2}$, rooted, the anterior largest, the posterior smallest. Ante-orbital foramen a deep narrow slit, widening above. Palate mostly on one plane. Descending ramus of lower jaw with the angles not situated above the plane of the crowns of the molars.

The above characters furnish some of the most striking peculiarities of the skull by which the *Murinae* differ from *Arvocolinae*. Others will be found detailed at length in the descriptions of the different genera. In many points the two sub-families are very closely related, so much so, indeed, as to render it somewhat unnatural to separate them. Still, as this can be done by well-marked characters, it is, perhaps, best to do so, especially in view of the very large number of species.

In further illustration of the peculiarities of the *Murinae* it may be stated that the glenoid cavity is considerably elongated and moderately wide. The posterior margin of the palate is usually behind the line of the posterior molars. The incisive foramina are large, and situated partly in the intermaxillary, partly in the maxillary bones. There are two moderately large foramina in the palato-maxillary suture. The coronoid process of the lower jaw is usually large, and the condyloid elongated. The descending ramus approaches more or less a quadrate form. The posterior lower angle is rounded, and the upper angle is acute.

The molars of the *Murinae* have transverse ridges on the unworn crowns, each ridge usually broken up into a series of tubercles. There are usually three such ridges on the first or anterior molar, two on the next, and on the last, one and a half. As the crowns wear away the tubercles disappear, until there is visible only the border of enamel, with undulations or transverse folds.

The feet of the *Murinae* are usually naked beneath; even when the heel is hairy the toes are naked and transversely ridged; the number of tubercles on the soles varies somewhat. The tail is more or less scaly, the scales arranged in whorls, with hairs passing out between the whorls, sometimes in such number or length as to conceal the scales entirely; these are, however, most generally visible.

The characters of the *Murinae*, as given above, although derived chiefly from the typical forms, apply pretty well to all the species throughout the world. There are, however, important differences, which serve to separate the Old World species from the New, and render expedient a further division into *Mures* and *Sigmodontes*—the former confined entirely to the Old World, the latter found only in America—and neither occurring wild with the other, except through human agency. It thus becomes possible, in all cases, to decide at once whether a given species caught on this continent is really native or has been introduced. They may be characterized briefly as follows:

MURES.—Old World Rats. Molars very large and broad. Those in the upper jaw with three tubercles in each transverse series.

SIGMODONTES.—New World Rats. Molars narrower. Those of the upper jaw with two tubercles or points in each transverse (or slightly oblique) series.

There are other differences, which will hereafter be referred to. It will be sufficient to add, that the possession of the larger teeth seems to impart to the Old World rats a greater degree of ferocity and strength, rendering them more cosmopolite and omnivorous than the American

species. I can, however, hardly assent to the sweeping generalizations of European writers in regard to the superiority of their rats, as a class, to ours. The fact that the Norway rat displaces the native species, whenever brought into contact with them, is easily explained by reason of their superior bulk, and the fact that the American species are much less in the habit of frequenting the vicinity of dwellings. Furthermore, the black rat, likewise a native of Europe, after it has taken possession of any premises, is displaced and exterminated by the Norway rat, both in this country and Europe, although not much inferior to the latter in size, and, like it, an Old World species.

There is a third group of Old World *Murinae* intermediate between the *Mures* and *Sigmodontes*, which has no American representatives, and by Wagner termed—

MERIONIDES.—The molars are not tuberculate nor pointed, but plane, the crowns traversed by transverse complete lamellae. The indentations of the teeth opposite, not alternate.

This group is distinguished from that of the true rats by having no tubercles on the molars, the crowns of which are composed of lamellae arranged nearly parallel, one behind the other. When very young, indeed, there may be transverse ridges, but these are continuous, not tuberculate, and, when slightly worn off, exhibit transverse and continuous loops of enamel. Still more worn, there is seen an encircling border of enamel, which indents the tooth, so that those of opposite sides are opposite to each other; not arranged in a zig-zag manner, with those of opposite sides alternating, as in the *Arvicolinae* and most *Sigmodontes*. The principal genera are *Meriones*, *Rhombomys*, *Psammomys*, *Mystromys*, *Malacothrix*, and *Euryotis*. All are natives of Africa or the continental portions of Asia. None of these genera occur in America, the so-called *Meriones* (more correctly *Jaculus*) belonging to the *Dipodinae*.

Tribe—MURES.

Molars broad; tuberculate; the tubercles in transverse series. Upper anterior molar, with three tubercles in each transverse series or with the tubercles in three longitudinal series. Confined to the Old World.

Although all the members of this section are inhabitants of the Old World, yet from the number of species introduced into North and South America, and the importance of clearly understanding the differences of the two groups, I shall describe their characteristics at considerable length, basing my remarks upon the genus *Mus*, to which all of our introduced species belong. The other principal genera are *Cricetus*, *Cricetomys*, *Phloeomys*, *Hapalotis*, *Pseudomys*, *Dendromys*, and *Akodon*. Of these the genus *Cricetus* is distinguished from *Mus* by the internal cheek pouches and hairy tail; has been assigned by some authors to North America, but further examination has, in all cases, shown the supposed species to belong to *Neotoma* *Hesperomys*, or some other peculiarly American genus.

MUS, Linnaeus.

Mus LINNAEUS, "Systema Naturæ, 1735."

Molars as in other *Murinae*, $\frac{3}{2}$; those of opposite sides parallel to each other; with two or three transverse series of tubercles, three in a series longitudinally; the central series elevated. No cheek pouches. Upper lips divided; snout acute, hairy to the fissure, whiskers in five series. Ears large, prominent, nearly naked. Tail long, the scaly whorls very distinct.

For most of the general considerations here presented respecting the minute features of the European and American mice I am indebted to Burmeister, who, in his "Naturgeschichte der Thiere Brasiliens, part I, 1854," has given the best view I have seen of the subject.

The number of species of true *Mus* is very considerable, amounting to over fifty. Of these only four have hitherto been detected within the limits of the United States, viz: *Mus decumanus*, *rattus*, *tectorum*, and *musculus*. *Mus leucogaster* has been found in Brazil. Several species described from South America, by Waterhouse and others, are probably varieties of some of the Old World species, wherever they are really not of American types. Such is *Mus Jacobiae*, Waterhouse, from the Gallipagos.

The molars of the genus *Mus*, as already stated, are broader and stronger than in the other allied genera. In the unworn condition, each one has two or three transverse ridges, cut up by depressions into small tubercles. They are coated externally by enamel, which sends folds into the dentine from both sides, shown in the worn tooth as indentations opposite to each other, with islands of enamel between, or even strips of enamel passing entirely across. The enamel folds on opposite sides never alternate with each other, but always stands in simple transverse series, a little convex anteriorly. In this point of having the indentations of opposite sides opposite each other there is a close approach to one of the characters of *Merionides*, which thus becomes applicable to all the Old World *Murinae*.

In the upper jaw the first molar has three transverse ridges, each one somewhat curved and concave behind. The first and second are divided into three tubercles; the third has but two; the smaller internal one being wanting. The second upper molar has likewise three ridges, the anterior, however, has but one tubercle (the inner;) the second ridge has three, the third, again, only two, the external one much smaller than the corresponding one on the first tooth. The third tooth is quite similarly constituted; as, however, it is much smaller than the second,

its tubercles are reduced in similar proportion. In the smaller species of *Mus*, as the mice, this tooth is relatively much smaller, and its constituents are only distinguishable with a pretty powerful lens.

The molars of the lower jaw are comparatively smaller, which permits the division of the transverse ridges into only two tubercles, each about equal in circumference to the central tubercles of the upper molars. The first lower molar is comparatively longer than the upper; it consists of four transverse folds, or ridges, the posterior very small, and having but one tubercle, and lying enclosed in the concavity of the preceding one. The second and third ridges are about equal, the first, however, is smaller, and its inner tubercle larger than the outer. The second molar has three cross ridges, much like the last three of the first molar; in *M. decumanus*, and perhaps in other species, there is, however, a small tubercle on the anterior face of the outer anterior tubercle, which may, in fact, be considered as a single and rudimentary external element of a fourth cross ridge like the first tooth. This tooth is shorter than the one which precedes it, but of even greater diameter; it is larger than its fellow of the upper jaw, in which respect the third molar resembles it; the first lower molar, though narrower than the first upper, is longer. The third lower molar consists only of two cross ridges, an anterior bituberculate one and a posterior, of considerable size.

When the teeth are much worn down, the first upper molar is seen to have two transverse folds of enamel islands, the following two only one complete one. In the lower jaw, the first molar has at first four, but the posterior soon disappears, leaving but three; the second and third molars have but one. In teeth of full grown but not old animals, the tubercles only of the cross ridges are worn off, and each tooth has as many broad, flat, sharp-edged cross ridges as it possessed originally of tuberculate ones.

The tail in the rats is covered with short, cordiform, quadrate scales, between the successive whorls of which appear stiff hairs of greater or less extent and number; upon the varying conditions in this respect depend the greater or less amount of covering to the tail. The number and degree of continuity of these whorls sometimes furnish good specific characters. The tail itself is seldom shorter than the body; in most instances it is longer. The paws are not naked, but the hairs are so short as usually to allow the flesh color of the skin to show through. Their nails are tolerably short, pointed, sub-compressed, and moderately curved. The palms are naked, with five small balls, three under the four toes; the fourth thumb ball is fused with the toe itself; a fifth ball is placed outside on the base of the hand. The balls of the hind foot are much more prominent, but similarly placed; there is a sixth on the inner edge of the sole, which is naked.

The fur consists of hair of different sorts; a softer, shorter, and woolly basal hair, with longer and stiffer ones interspersed. In old animals, especially the larger rats, some of the latter have a still greater development, especially on the lower part of the back. These hairs, when examined with a lens, are seen to be flattened with a fine longitudinal furrow.

The female has five pairs of teats, three pairs on the belly, between the thighs, and two on the breast, between and behind the arms.

MUS DECUMANUS, Pallas.

Norway Rat --- Brown Rat.

Mus decumanus, PALLAS, Glires, 1778, 91.

SCHREBER, Säugt. IV, 645; tab. clxxviii.

KEYSERLING und BLASIUS, Eur. Wirb. I, 1842, 36.

DEKAY, N. Y. Zool. I, 1842, 80.

WAGNER, Suppl. Schreb. III, 1843, 1.

BURMEISTER, Thiere Brasiliens, I, 1854, 152.

AUD. and BACH, N. Am. Quad. II, 1851, 22; pl. liv.

Mus norvegicus ERXLEBEN, Syst. An. I, 1776, 381.

Norway Rat, PENNANT, "British Zoology."

Brown Rat, PENNANT, "Synopsis Quadrup."

SP. CH.—Tail about three-quarters of an inch shorter than head and body. Tail sparsely hairy, with about two hundred annuli. Above, grayish brown, mixed with rusty; grayer on the sides; beneath, ashy white. Upper surface of the feet dirty white. Body, 8 to 10 inches.

The general peculiarities of head, feet, and tail, are as in *M. tectorum*. The tail is, however, much shorter, being considerably less than the head and body.

The upper parts are grayish brown, mixed with faint rusty, and darkened by black tipped hairs; the sides are grayer; the belly and feet a light whitish ash, not so pure as in *Neotoma* or *Mus tectorum*. The under surface of the tail is a little paler than the upper, which is dusky. In the dried skin the annuli of the tail are much less distinct than in *M. rattus* and *tectorum*, owing to the rather longer hairs.

Specimens from Oregon appear to have the tail slightly longer than those from the east side of the mountains.

Measurements of a fresh specimen.

	Inches.	Lines.
Nose to occiput.....	1	9
eye.....		8 $\frac{3}{4}$
ear.....	1	4
root of tail.....	6	5
end of outstretched hind legs.....	7	-----
Tail, from root to end of vertebræ.....	5	9
hairs.....	5	9
naked portion.....	4	11
Ear, height posteriorly.....		9
anteriorly.....		7 $\frac{1}{2}$
internally above skull.....		6
above notch.....		8
width in natural position.....		6 $\frac{1}{2}$
Arm, from elbow to end of claws.....	1	8
forefoot to end of claws.....		9
longest claw.....		1
Leg, from knee joint to end of claws.....	2	6
tibia.....	1	4
hind foot from heel to end of claws.....	1	6
longest claws.....		2

Annuli of tail 190 to 200.

The brown rat is well known over the world for its destructive propensities and the injury it causes to house and store. According to Pallas, it belonged originally to the warmer regions of Central Asia, Persia especially. Thence it crossed the Volga, in large troops, in 1737, peopled Russia, and subsequently overspread the whole of Europe. According to Erxleben, it reached England in 1730, and France in 1750. In 1775 it was taken to North America, some time subsequent to the black rat, which it soon drove out and nearly exterminated. At the present time no portion of the globe seems free from its pernicious presence, although, as it is usually transported in ships, its first foothold is on and near the seacoast. In 1851, Audubon and Bachman spoke of it as not found on our Pacific coast. At the present time, however, it is very abundant there as far north as the Columbia river.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.						
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore ft.
1567	2398	...	Essex county, N. Y.....	.....	Dr. S. E. Hale.....	Skin.....	.....	.....	.....	.....	.....	.....	.....
843	1900	...	do.....	Aug. 14, 1855	S. F. Baird.....	do.....	.....	.....	1.84	6.00	5.00	5.00	.....
1102	.....	.....	Middleboro', Mass.....	Nov. 5, 1855	J. W. P. Jenks.....	do.....	.....	.....	.....	.....	.....	.....	.....
2816	.....	♂	Wethersfield, Ct.....	.....	C. Wright.....	Alcohol.....	.62	1.10	1.48	4.08	3.42	.....	.58 1.22
2817	.....	○	.....do.....	.....	.....do.....	do.....	.62	1.10	1.48	4.08	3.42	.....	.58 1.23
2818	.....	○	.....do.....	.....	.....do.....	do.....	.59	1.07	1.40	3.80	3.35	.....	.57 1.21
2819	.....	○	.....do.....	.....	.....do.....	do.....	.62	1.10	1.45	4.10	3.46	.....	.60 1.23
1295	2097	.....	Washington, D. C.....	.....	.....do.....	Skin.....	.....	.....	.....	8.00	6.20	6.30	.....
1294	2096	♀	do.....	.....	.....do.....	do.....	.....	.....	1.84	2.00	6.84	7.00	.....
502	1637	♀	do.....	Feb. 15, 1855	do.....	do.....	.....	.....	.....	6.25	6.08	.....	.....
2826	1120	.....	Washington, Miss.....	.....	Col. Waites.....	do.....	.....	.....	.....	.....	.....	.....	.....
2813	.....	♂	.....do.....	.....	.....do.....	In alcohol.....	1.03	1.88	2.40	8.70	7.95	.....	.78 1.62
2814	.....	♂	Petaluma, Cal.....	.....	E. Samuels.....	do.....	1.02	1.80	2.20	8.40	7.70	.....	.82 1.67
2815	.....	♀	.....do.....	.....	.....do.....	do.....	1.08	2.05	.....	8.88	7.40	.....	.84 1.68
506	.....	.....	Astoria, O. T.....	.....	Lt. Trowbridge, U. S. A.....	Skin.....	.....	.....	.....	.....	.....	.....	.....
277	.....	.....	Steilacoom, W. T.....	.....	Gov. I. I. Stevens.....	do.....	.....	.....	.....	.....	.....	.....	.....
389	.....	♀	Stockholm.....	.....	Swedish Acad.....	do.....	.....	.....	.....	.....	.....	.....	.....

¹ Collected by Dr. Geo. Suckley, U. S. A.

MUS RATTUS, L.

Black Rat.

Mus rattus, LINNÆUS, Syst. Nat. I, 1766.

DEKAY, N. Y. Zool. I, 1842, 79.

AUD. and BACH. N. Am. Quad. I, 1849, 189; pl. xxiii.

GIEBEL, Säugt. 1855, 555.

Mus americanus, DEKAY, N. Y. Zool. I, 1842, 81; pl. xxi, f. 1.

Mus nigricans, Raf. Am. Month. Mag. III, 1818, 446.

SP. CH.—Tail about as long, or a little longer, than the head and body. Above, sooty black, passing insensibly into dark plumbeous on the belly; sometimes a little paler. Feet brown; fur of the back without the longer coarse bristles of the brown rat.

This species may be readily distinguished from the common brown rat by the much darker colors. In a specimen from Montreal, the upper parts are of a lustrous sooty black, with a green

reflection ; this passes very insensibly on the lower parts into a dark plumbeous ; the tail of the same plumbeous cast ; the feet tinged with brown.

In a specimen from Sweden, on the other hand, the upper parts are not quite so sooty ; the plumbeous of the belly is of a grayer shade ; the line of separation on the sides quite distinct. This coloration is seen also in specimens from San Diego.

This rat, once better known than the brown rat, is rapidly diminishing since the introduction into its haunts of the latter species. Its original locality is not well known, as from time immemorial it has been the "house rat" of Europe, and of the warmer parts of the world generally. According to Erxleben, it was brought to the New World about the year 1544, and spread to such a degree as to have been apparently more abundant there than in the Old World. Indeed, many authors have insisted that the species came originally from America, but there is no foundation for such a supposition zoologically ; and it is spoken of familiarly by such authors as Gesner, Aldrovandus, Seba, and others, at as early a date as 1550.

The black rat is not mentioned by Burmeister among the animals of Brazil, where the *Mus decumanus*, *leucogaster*, and *tectorum*, are abundant.

In their article on the black rat, Audubon and Bachman refer to a white bellied variety of the black rat, from the Edisto river, in South Carolina. This is most probably the *Mus tectorum*, described in the next article.

I have satisfied myself, from actual examination of the skin and skull of the original *Mus americanus* of DeKay, that it is really a *Mus*, and of the present species.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
390	-----	-----	Sweden -----	1843	Swedish Academy -----	Skin -----
1471	-----	-----	Halifax, N. S. -----	-----	Dr. J. B. Gilpin -----	do -----
837	-----	-----	Montreal, Can -----	-----	T. Broome -----	do -----
839	1896	-----	Tamaqua, Pa. -----	-----	W. Patten -----	do -----
12	921	-----	Foxburg, Pa. -----	-----	S. F. Baird -----	do -----
1603 ¹	-----	♀	San Diego, Cal -----	Jan. 22, 1856	Dr. J. F. Hammond, U. S. A. -----	do -----
1604 ²	-----	♂	do -----	do -----	do -----	do -----
1605	-----	♂	do -----	do -----	do -----	do -----
514	1649	♀	Humboldt Bay, Cal -----	-----	Lt. Trowbridge, U. S. A. -----	do -----

¹ Body, 7 ; tail, 7½.

² Body, 8½ ; tail, 6¾.

MUS TECTORUM, Savi.

White Bellied Rat; Roof Rat.

Mus tectorum, SAVI, "Nuovi Giornale di Lett. 1825."

BONAPARTE, Fauna Italica; plate.

KEYS. & BLASIUS, Europ. Wirb. 1842, 36.

WAGNER, Suppl. Schreb. III, 1843, 405.

BURMEISTER, Thiere Brasiliens, I, 1854, 154.

GIEBEL, Zoologie, 1855, 555.

Mus alexandrinus, "GEOFFR. Desc. de l'Egypte."

Mus flaviventris, "LICHT. Brants Muizen, 108."

Mus infuscatus, "WAGNER, Suppl. Schreb. III, 1843, 445.

Mus setosus, "LUND, Bras. Dyt."

? *Mus rattus*, var. AUD. & BACH. N. Am. Quad. I, 1849, 191, 194; plate xxiii. (Light-colored figures.)

Mus americanus, "SEBA, Thes. II, 30; tab. xxix."

ERXLEBEN, Syst. An. I, 1776, 385.

LECONTE, Pr. A. N. Sc. Phil. VI, 1853, 414.

Rat d'Amérique, "BRISSON, Reg. An. I, 172."

SP. CH.—Smaller than the Norway rat; tail from one to two inches longer than head and body, sparsely hairy, with about 240 annulations; color above, like the Norway rat; beneath with upper surface of feet, pure yellowish white. Like the Norway rat, the fur of the back is coarse, and mixed with longer stiffer bristly hairs.

This rat, in general appearance, exhibits a close resemblance to *Mus decumanus*, but may be readily distinguished by appreciable characters hereafter to be pointed out. The head of this species is compressed, and rather blunt. The eyes are pretty large, but smaller than in *Neotoma*. The whiskers are long, black, arranged in five series. The upper lip is cleft to the base of the incisors, whence to the end of the snout, a distance of about a quarter of an inch, it is indented by a furrow which passes along the septum, and the bottom and sides of which are free from hairs. The hairs come to the extreme end of the muzzle above, so that no naked portion is visible from above; the edge of the hairy upper surface is separated by a transverse constriction from the septum, and below it is another transverse furrow which, with the longitudinal one already described, divides this septal portion into four spaces. The nostrils are terminal, but situated slightly oblique.

The ears appear very large, exceeding considerably those of *M. decumanus*, and almost like *Neotoma*. They are, however, of thicker membrane and entirely destitute of an antitragal valve; they are sub-orbicular, rather higher than wide, and very scantily and sparsely covered with short hairs, so as to appear almost naked on both surfaces.

The thumb of the fore finger is very rudimentary, with a broad flat nail; there are five large tubercles on the palm; the two posterior very large. The hind feet are short and broad; the soles entirely and conspicuously naked, even to a short distance behind the heel; there are six tubercles on the sole; two at the bases of the three middle toes, and one each at the bases of the first and fifth; these four are very large and nearly equal; the fifth is considerably smaller, rounded, and placed a little behind that of the fifth toe; the sixth begins about the same distance behind the tubercle of the first toe, but is very long and narrow; slightly crescentic, (the concavity internal); it is about one fifth the length of the whole foot; its posterior extremity as far from the heel as its anterior is from the base of the middle toes. The entire sole between the tubercles is perfectly smooth, without granulation; the toes are transversely ridged beneath.

The tail is rounded, and tapers gently to a truncate tip; it is nearly two inches longer than the head and body, and has 237 annulations of scales.

The fur of this species is composed of two kinds of hairs, one external, coarse and rigid, the other shorter, finer, and intermediate.

The color of this species above is much like that of the Norway rat, being of a yellowish brown, slightly tinged with reddish on the sides of the back, and grayer on the sides. A predominance of black hairs on the back imparts here a dusky appearance. The entire under parts, with the upper surfaces of the feet, are quite pure yellowish white, to the very roots of the hairs. The ears and entire tail all round are dusky.

The only specimens of this species I have seen from America are those entered below, of which one in alcohol (2811) has served as the basis of the present description. A specimen received from Nürnberg, and probably caught there, has the long tail, but is not so white beneath. It has 240 annuli on the tail.

This species is smaller than the common rat, and the tail, instead of being shorter than the head and body, is much longer. The under parts and feet are nearly pure yellowish white. The ears are larger.

The *Mus leucogaster* of Pictet, has the tail not quite so long, and the hairs soft, of equal length, and without any intermixture of long stiff bristly ones.

The roof rat, so called from its fondness for inhabiting the thatched roofs of houses, is originally from Egypt and Nubia, from which it was taken to Italy and Spain. It is quite probable that the early Spanish discoverers and conquerors carried it to America in their vessels, and thus introduced it on the continent long before the brown or even the black rat. It is now very common in Brazil and some parts of Mexico; and if, as I have little doubt, the "light-colored variety of the black rat" of Audubon and Bachman be this species, it is abundant in Georgia and South Carolina, (according to Major Leconte, more so formerly than now,) and doubtless also in Florida. It is said by Mr. Bridger to be very common about Tarboro', North Carolina; further north I have no knowledge of it.

I have myself verified very few of the quotations at the head of this article, and am unable to say why authors have retained the name of *M. tectorum* in preference to the apparently older one of Geoffroy. The *Mus americanus* of some authors is, in every probability, this same species, which, after its very early introduction into America, (probably in the fifteenth century,) became naturalized, and, at an early date, was described by Seba as *Mus americanus*, probably from South American specimens. The roof rat was not formally separated or distinguished as a European species for nearly a hundred years after, and it is not difficult to understand that an animal so conspicuously different from the Old World rats known at that time, and brought from America, should have been described as new. The name of *americanus* has really priority over either *tectorum* or *alexandrinus*, but is objectionable as conveying an erroneous idea of native locality.

List of specimens.

Catalogue number.	Corresponding number of skull.	Locality.	Whence obtained.	Nature of specimen.	Measurements.									
					Tip of Nose to—				Tail to end vert.	Length of—		Skull—		Height of ear.
					Eye.	Ear.	Occip.	Tail.		Fore ft.	Hind ft.	Length.	Width.	
866	1919	Tarboro', N. C.....	J. L. Bridger....	Skin .....	.....	.....	.....	.....	.....	.....	.....	1.60	.77	....
2811	.....	.....do.....	do.....	In alcohol....	.80	1.50	1.90	6.15	7.92	.70	1.41	.....	.....	.75
1685	563	Cadereita, N. Leon, Mex.	Lt. D. N. Couch...	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2911	.....	.....do.....	do.....	Skin .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2812	.....	Nürnberg, Germany...	F. Stierns.....	do.....	.76	1.45	1.85	5.95	6.78	.60	1.24	.....	.....	.73

MUS MUSCULUS, Linn.

Common Mouse.

Mus Musculus, LINN. Syst. Nat. I, 1766, 83.

KEYS. & BLAS. Wirb. Europ. 1842, 37.

WAGNER, Suppl. Schreb. III, 1843, 409.

AUD. & BACH. N. Am. Quad. II, 1851, 277; pl. xc.

BURMEISTER, Thiere Bras. I, 1854, 155.

GIEBEL, Säugt. 1855, 557.

Sp. CH.—Tail a little longer than the body. Soles entirely naked. Above grayish brown, finely lined with darker, passing insensibly into ashy plumbeous, with a dull reddish tinge on the belly. No distinct line of demarcation. Tail dusky all round; feet ashy brown.

It is not necessary to enter into any lengthened description of the external form of the common house mouse, as its characteristics are much as in the large rats already described. The tail is usually a little longer than the body.

The color of the upper parts is usually of a grayish brown, very finely and intimately lined with blackish, sometimes with a tinge of rusty. This passes very insensibly through the rather more yellowish sides into the ashy plumbeous of the belly, without any dividing line of any kind. There is on the belly a faint wash of a light mud color. The feet are ashy brown; the under part of the tail scarcely lighter than the upper.

While this is perhaps the most constant color, there are occasional variations. Thus, in a series from Middleboro', (864,) the under parts are of quite a pure yellowish white; the upper parts are lighter than as described; the sides are washed faintly with fulvous, and the outside of the whitish belly exhibits a brownish tinge, forming a band. The feet are almost pure white; the under surface, however, of the tail scarcely lighter. This same condition is seen in specimens from Sweden.

On the other hand, the body is sometimes much darker than usual. One specimen from Burlington, Vermont, (1316,) is as dusky as in most skins of the black rat.

It is not easy to confound the white-footed native mouse of our country with the house mouse in any of its phases, as its much larger ears, hairy heels, sharply defined white belly and feet, and many other characters, will at once distinguish it.

The house mouse is originally a native of Europe and Central Asia. At the present time it

is found all over the world. Specimens in the museum of the Smithsonian Institution show its range to be along the entire coast region of the United States, and far in the interior. Some localities, however, even in the older States, are yet comparatively free from them, such as the Adirondac region of New York, &c. Here the white-footed mouse enters and occupies the house and out buildings, without doing as much mischief, perhaps, as the common mouse.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex & age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
2226			St. Gothard, Switz.		Museum, Geneva	Skin
394		♀	Stockholm, Sweden		Swedish Academy	do
1661			Scotland		Sir W. Jardine	do
2057			Halifax, N. S.		Dr. Gilpin	do
945			Middleboro', Mass.		J. W. P. Jenks	do
845 ¹	1903	♂	Elizabethtown, N. Y.	Aug. 14, 1855	S. F. Baird	do
963 ²	2005	♂	Washington, D. C.	Nov. 5, 1855		do
1223	2067	♂	Clarke county, Va.		Dr. Kennerly	do
164	1147		Prairie Mer Rouge, La.		Jas. Faire	
			St. Simon's Island, Ga.		Dr. Wilson	In alcohol
			Indian River, Fla.		G. Wurdemann	do
			Brownsville, Texas		Lieut. Couch	do
			Parras, Coahuila		do	
			Guayapuco, Mexico		do	
			City of Mexico		Major Rich	
1773			Crossing of Pecos, N. M.	Sept. 1855	Captain Pope	Skin
2955			Fort Riley, K. T.		Dr. W. A. Hammond	do
30			Fort Pierre, Neb.	1850	T. Culbertson	do
			Elk river, Neb.		Dr. Hayden	
			Fort Conrad, N. M.		Dr. Kennerly	
			San Diego, Cal.		Dr. J. F. Hammond	
			Fort Reading, Cal.		do	

¹ 1. 00 ; 3. 42 ; 3. 42 ; 3. 43.

² 1. 10 ; 3. 20 ; 3. 00 ; 3. 10.

Tribe—SIGMODONTES.

Molars complicated, with the points on the crown never more than two in the transverse series, or rather arranged in two longitudinal series. Confined to the New World.

The genera which may be grouped under this head are *Hesperomys* with its subdivisions, *Reithrodon*, *Holochilus*, *Sigmodon*, and *Neotoma*, the latter approaching the *Arvicolinae* in the shape of the crowns of the molars. All are found in North America, except *Holochilus*, and most of the subdivisions of *Hesperomys*. *Neotoma* and *Sigmodon* do not occur south of Mexico.

In the structure of the incisors, the *Sigmodontes* do not differ from the *Mures*; the molars are, however, constructed on an entirely different pattern. In extreme youth each tooth exhibits two longitudinal series of high conical tubercles, connected by somewhat lower transverse ridges. The first molar has generally three tubercles on each side, the second two, and the third only one, with sometimes a median one on the hinder edge. The first tooth, however, particularly the contracted one of the lower jaw, sometimes has the first or anterior pair of tubercles so close together and reduced as to appear like one, especially when somewhat worn. At the bottom, between the elevated crests connecting these tubercles, may be seen sharply defined curved narrow furrows; these furrows or grooves (generally darker than the rest of the crown) mark the spaces between the enamel folds, which dip deep into the dentine. The direction and size of these furrows varies on the two sides of the teeth. In the upper jaw they penetrate more deeply from the outside, and bend around a little backwards, so as to be rather convex anteriorly, concave posteriorly; in the lower jaw, on the other hand, it is the inner furrow which is deepest, and this curves forward so as to be concave anteriorly. The furrows of each tooth opposite to those described (the inner of the upper molars and the outer of the lower) are shorter, broader, and more perpendicular to the longitudinal direction of the tooth. In some forms, a very close examination will bring to light a small accessory tubercle in the furrows, near the outer edge, below the level of the others.

The above structure is that presented by an unworn tooth; it is, however, rare to find one in this condition, abrasion commencing at a very early age. In time, the tubercles, the most projecting part of the enamel, as well as the connecting crests, are all ground off, leaving a flat surface, bounded by a zigzag outline of enamel. After the abrasion is continued still further, the points of the accessory tubercles are ground off, so that behind each salient angle of the enamel zigzag is attached a small accessory angle, and the bend of the curve externally is no longer simple but double; consisting of a larger and a smaller curvature. Up to this point the narrow folds in the grinding surface are still open externally, but, with increasing abrasion, they become obliterated, or ground out externally, leaving narrow curved enamel islands, on account of being less deep externally than towards the centre of the tooth. This condition of external folds with islands of enamel marks the maturity of the species; subsequently all the latter are ground out, leaving merely an obtusely indented border of enamel around the tooth substance, the folds dipping in deeper on one side than another. This indicates the old age of the animal. These successive changes do not all take place at the same time in the different species; but their general progression and succession is much the same in all.

From the preceding remarks, (by Burmeister,) based on a comparison of a number of skulls of South American species, it will be seen that the number of folds in the teeth will not afford

good characters for the establishing of groups, younger specimens having more folds than old ones of the same species, for, as the accessory tubercles along the edges of the main ones are ground off, the two folds originally between these are lost. In the opinion of Burmeister, therefore, the shape, number, or character of these folds cannot be relied upon for defining groups, or even of genera, for the reasons above mentioned.

The roots of the molars are much in proportion to each other as are the tubercles, although fusion of the pairs of roots is more frequent and intimate than that of the tubercles. The first upper molar has one large root in front, and behind this on the outside are two small roots, on the inside one larger. The second upper molar has two roots externally, one large one inside. The third has generally the same number as the second, but they are smaller. The roots of the lower molars are somewhat differently arranged; the first or anterior tooth has four roots, but of these, one anterior and one posterior are large roots, and between these, two other small ones opposite each other. The second and third molars have each two roots, the posterior somewhat the larger.

The genus *Neotoma*, and to some extent *Sigmodon*, are somewhat different from what has been described above as more particularly characteristic of the *Hesperomys* group. Their peculiarities will, however, be adverted to more fully under their respective heads. Thus, the first upper molar of *Neotoma* (*N. occidentalis*, 1662) has but three roots, two external, and one internal and between the other two, which are also anterior and posterior—all of nearly equal size. The second molar has two roots—one anterior, one posterior—the anterior, however, looking as if formed by the fusion of three small contiguous ones. The third has likewise two roots, the anterior composed probably of two.

I have never seen, either in *Sigmodon* or *Neotoma*, any tubercles on the molars, even in the youngest teeth examined, the crowns being plane with loops of enamel. Some of the other generalizations do not apply very well to our North American species.

In further illustration of the peculiarities of the American muroids, it may be remarked that the upper lip is generally thicker, more fleshy, and broader across the nose than in the Old World species.

The American *Sigmodontes*, as above stated, belong to the genera *Hesperomys*, *Reithrodon*, *Holochilus*, *Sigmodon*, and *Neotoma*. All these occur in North America, excepting *Holochilus*. These may be most readily characterized as follows:

Hesperomys. Small, mouse-like. Molars narrow, with two longitudinal series of alternating points.

Reithrodon. Like the preceding, except that the upper incisors are grooved anteriorly.

Holochilus. Rat-like; upper lip not fully cleft; last upper molar equal to the first.

Sigmodon. Arvicoloid; upper lip scarcely cleft; two posterior lower molars with the enamel loop sigmoid; lobes all rounded.

Neotoma. Rat-like; teeth arvicoloid; crowns composed of triangles; posterior lower molar with the enamel outline somewhat 8-shaped.

REITHRODON, Waterhouse.

Reithrodon, WATERHOUSE, Pr. Zool. Soc. Lond. V, 1837, 30.

WAGNER, Suppl. Schreb. III, 1843, 545.

Form murine. Ears and tail short, hairy. Upper incisors with a longitudinal channel along the anterior face. Other characters much as in *Hesperomys*.

Although the general appearance of this genus is much like that of *Hesperomys*, yet, as Wagner pertinently remarks, in a group embracing so large a number of species, and resembling each other so closely as *Hesperomys*, the fact that *Reithrodon* has the sharply defined character of grooved incisors is legitimate ground for separating the two. There are, however, other characteristics of value which will be adverted to hereafter.

But three species have been hitherto described from South America, all from its extreme southern portion; and it is for this reason a matter of some surprise to find the genus represented in the United States as first announced by Major Leconte. Ours are, however, considerably smaller than the South American, and differ in several other points, as will be indicated hereafter.

The South American species are said to resemble small rabbits in their general appearance. The North American are more like slender house mice. The body is depressed, the limbs short. The head is considerably shorter, broader, and more arched than in *Hesperomys*; the ears shorter, lower, and quite densely covered with turry hair. The tail is either longer or a little shorter than the body, and coated with hair. The thumb is rudimentary, with a blunt nail; the hind part of the soles, at the heel, hairy.

The grooving of the upper incisors is much like that of *Jaculus*, only deeper, (the incisor considerably more curved.) The anterior edge is rabbetted down on its entire outer half somewhat below the level of the inner portion, and the edges rounded; both portions of the anterior face, as seen from in front, are symmetrical, and strongly convex transversely; viewed laterally, the outlines are distinctly visible, parallel to each other, and one behind the other. The molars, in shape and indentations, are much as in the North American *Hesperomys* (*Calomys*). The skull is short, and the cranium swollen and strongly convex in all directions; the upper edge of the orbit sharp and continuous, with a low ridge on the cranium. In the great width and convexity of the cranium there is much difference from *Calomys*. Other differences are seen in the backward prolongation of the incisive foramina to the line of the first molars; the larger size of the palato-maxillary foramina; the greater divergence of the axes of the auditory bullae; the greater posterior extension of the palate, &c.

The most striking difference in the lower jaw is seen in the abrupt twisting inward of the lower half of the descending ramus. This inferior half is quite horizontal in position; and when the jaw is viewed laterally, there seems to be as much of the ramus as in *Calomys*, without taking into account the hidden internal portion, which in the latter is very much less in extent.

The general appearance of the North American species of *Reithrodon* is intermediate between that of the common domestic mouse and the white-footed mice. The tail is nearly as long, or longer, than the body; the ears smaller than in the *Hesperomys leucopus*, more buried up in the fur; the membrane thicker and covered with longer hairs. The antitragus is very much de-

veloped into a valve capable of closing the meatus, much more so than in the *H. leucopus*. The thumb is rudimentary, with a broad nail; the posterior portion of the heel is hairy.

The species of *Reithrodon* in North America are confined, on the Atlantic border, to the southern States; they are found about St. Louis and westward to the Rocky Mountains, whence specimens were brought by Lieut. Beckwith. Species occur also in New Mexico, Sonora, and California.

I have never seen either skins or skulls of *Reithrodon* from South America; but judging from the figures given by Waterhouse, there are considerable differences, not only in size, but also in other characteristics. It is, however, impossible to indicate these discrepancies without making a careful comparison of specimens from the two continents.

To Major Leconte is due the credit of first pointing out the existence of *Reithrodon* as a North American genus.

REITHRODON HUMILIS.

Harvest Mouse.

Mus humilis, AUD. & BACH. Pr. A. N. Sc. Phila. I, Oct. 1841, 97.—IB. J. A. N. Sc. Phila. VIII, II, 1842, 300.—IB. N. Am. Quad. II, 1851, 103; pl. lxxv.

Hesperomys humilis, WAGNER, Wiegman, Archiv, 1843, II, 51.

Mus leontii, AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 307.—IB. N. Am. Quad. III, 1854, 324.

Hesperomys leontii, WAGNER, Wiegman, Archiv, 1843, II, 51.

Reithrodon leontii, LECONTE, Pr. A. N. S. Phila. VI, Oct. 1853, 413.

SP. CH.—Tail a little shorter than the head and body (about two-tenths of an inch). Head and body less than 2.50 inches; usually under 2.25. Hind feet .60. Ears large, with thin membrane covered with short hairs. Color above, mouse gray brown, or a little darker; cheeks, and generally the lower part of the sides, fulvous. Beneath, grayish white, tinged with reddish, with a plumbeous aspect. Oral region, chin, and feet, white.

This animal is considerably smaller than the domestic mouse, (very nearly the size of the *Mus agrarius* of Europe,) but resembles it very much in general appearance; so much so, in fact, that the grooved incisors will only distinguish them at first glance. The head is small and slender; the ears are quite large, almost equal to the *Hesperomys leucopus*; they are, however, apt to appear smaller than in reality, from being partially buried in the fur. They are slightly obovate, rounded at the apex, rather longer than wide; the auricle very thin and delicate. The antitragus is conspicuously developed as an elongated valve, capable of closing the meatus; it is much more distinct than in *Hesperomys*; both surfaces are covered with short, close hairs, except around the meatus, which is naked. The nose is as in *Hesperomys*, the muffle hairy to the end; the septum and region round the nostrils naked; a furrow in the middle of the septum continued into a cleft of the upper lip. The eyes are diminutive, smaller than in *Hesperomys*.

There are no striking peculiarities in the feet; the thumb is rudimentary, armed with a broad, short, flat nail. There are six large tubercles on the hind feet and five on the fore, as described in *Neotoma* and *Hesperomys*. The toes are as in the latter genus. The soles are covered with scattered hairs as far as the tubercles, the hairs densest towards the heel. The remaining portion is naked, with a pavement of moderately large scales.

The tail is somewhat variable in length; usually, however, it is as long as the distance from

its root to the eye, or a little less than the head and body. It is well covered with short hairs, concealing the annuli.

The colors of this animal are quite similar to those of the common house mouse; the back being of almost precisely the same shade of brown, perhaps a little darker. The under parts are grayish white tinged with reddish, but the lead-colored bases of the hairs, usually quite distinctly visible, impart a plumbeous aspect. The cheeks generally are fulvous, and in many specimens there is a distinct band of the same on the lower part of the sides. The feet, region round the mouth, and chin, and under half of the tail are white, much more conspicuous in the alcoholic specimen than in the dried skin.

Several specimens from St. Louis resemble this very closely, but are not in sufficiently good condition to be determined.

The first published description of this species was by Audubon and Bachman in 1841. The *Mus lecontei* of the same authors appears to be very similar, except that the fulvous stripe on the sides is less distinct. As there is no difference except what might naturally result from age, I have reduced this name to a synonym.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.						
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Length of fore foot.	Length of hind foot.
1052	.....	.....	Society Hill, S. C.....	.....	M. A. Curtis & sons....	Skin.....	.....	.....	.....	.....	.....	.....	.....
1053	.....	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
1064	2017	.....	do.....	Aug., 1855.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
1993	.....	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
1995	.....	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
2535	.....	.....	do.....	.....	do.....	In alc.....	.38	.77	.88	2.42	2.25	.30	.60
2536	.....	.....	do.....	.....	do.....	do.....	.40	.80	.90	2.10	2.01	.28	.60
2537	.....	.....	do.....	.....	do.....	do.....	.33	.66	.85	2.10	1.90	.27	.50
2538	.....	.....	do.....	.....	do.....	do.....	.35	.70	.86	2.15	1.97	.28	.57
815	.....	.....	Liberty county, Ga.....	.....	Major Leconte.....	Skin.....	.....	.....	.....	.....	.....	.....	.....
2247	.....	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
2248	.....	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....
2569	1691	♂	St. Louis, Mo.....	.....	Dr. G. Engelmann ..	do.....	.....	.....	.....	.....	.....	.....	.77
2570	1692	♂	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....

REITHRODON MONTANUS, Baird.

Reithrodon montanus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.

Sp. Ch.—Tail very little less than head and body, which barely exceed two inches. Hind foot .50. Ears small, the membrane thickened, and with long coarse hairs. Above, brown and pale yellowish gray, much lighter than mouse color. Outside of ears and flanks, pale yellowish brown, without any rufous. Beneath, dull whitish.

The single specimen of this species brought by Captain Beckwith appears quite adult, though of very diminutive size, that of a half grown mouse. The head is short and considerably arched, the muzzle hairy, except the septum and the inner edges of the nostrils, on which no

caruncle is discernible. The ears are large and broad, rather densely coated with longish hairs, which, in this case, as well as on the rest of the body, are longer than usual in *Hesperomys*. The base of the ear is concealed by the long hairs on the cheeks. The tail is nearly as long as the body, and the hairs on it sufficiently dense to obscure the muroid scaly rings. The fore foot is too much distorted to show the comparative length of the fingers. On the hind foot, the central three toes are longest and nearly equal. The fifth claw reaches to the base of the fourth. The sole is hairy to near the end of the metatarsus.

The predominant color above is a mixed brown and pale yellowish gray; beneath, dull whitish; on the flanks and the outside of the ear, pale yellowish brown. Nowhere any tinge of rufous. The hairs above are lead color at their base, then dull grayish yellow, and tipped with dusky. On the sides, the yellowish is brighter and the dusky tips wanting, in great measure. The tail is dusky above, whitish beneath and on the sides, the difference of color scarcely discernible. The feet also are whitish.

General dimensions.

	441.	
	Inches.	Lines.
Nose to occiput		10
root of tail	2	2
Tail, from root to end of hairs	2	
Ears, height, posteriorly		3½
internally, above notch		4
width		2¾
Leg, hind foot, from heel to end of claws		6
Skull, length		9½
Longest hairs on the back		3½

This species appears to differ from the *R. humilis* in longer tail, shorter hind feet, and the absence of any rufous on the body. The imperfect condition of the specimen prevents more minute details. The ears, however, are smaller, the auricle thicker, and covered with longer and coarser hairs than in *Hesperomys*, more as in *Arvicola*. The under parts are of a much purer white.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Original number.	Nature of specimen.	Collected by—
441	1306	Rocky Mountains, 39°	Capt. E. G. Beckwith, U.S.A.	13	Skin.....	Mr. Kreutzfeldt.

REITHRODON MEGALOTIS, Baird.

Sp. Ch.—Largest of North American species. Head and body from 2.50 to 3.00 inches; tail about two-tenths shorter. Hind foot near .70. Ears large, moderately clothed with hair. Above mouse-gray, lined with darker, and tinged with rusty; on the rump and sides a fulvous wash. Beneath, soiled yellowish white.

Two specimens of *Reithrodon* were collected by Dr. Kennerly, between Janos, Sonora, and San Luis Spring, which I cannot readily refer to any of the described North American species. For a fuller account I would refer to the report of the United States and Mexican Boundary Survey.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.	Measurements.										Collected by—
					From tip of nose to—				Tail to end of—		Length of—		Length of skull.	Height of ear.	
					Eye.	Ear.	Occip.	Tail.	Verteb.	Hairs.	Fore ft.	Hind ft.			
1039	2281	Janos to San Luis Spring.	Maj. W. H. Emory, U. S. A.	Mounted.	.....	.....	.....	3.00	2.25	2.30	.....	.68	.84	.43	Dr. C. B. Kennerly.
1040	.....	.....do.....	do.....	In alc....	.40	.72	.88	2.42	2.25	.....	.30	.50	.....	.....	.....

REITHRODON LONGICAUDA, Baird.

Sp. Ch.—Size small. Tail considerably longer than the head and body, (which measure from 2.10 to 2.30 inches.) usually from three to eight tenths of an inch longer. Hind foot .65 to .70 of an inch. Above dark brown; beneath white, tinged with reddish yellow. A broad wash of bright fulvous on the sides and cheeks.

This animal, in the character of head, ears, nose, and feet, is very similar to what has been described in *Reithrodon humilis*. It is, however, of larger size, the ear and tail absolutely larger. The tail is rather longer than the body, instead of shorter.

The colors are very similar; the back is a dark brown, rather darker than in the house mouse, but otherwise very similar. The belly is soiled white tinged with reddish yellow; on the sides is a broad wash of fulvous extending to the cheeks. The feet, chin, and under parts of the tail are white. In some specimens, apparently younger ones, the belly approaches more to the whiteness of *Hesperomys*, though never attaining it. The cheeks are, perhaps, brighter than in *R. humilis*. The hind feet are considerably longer than in *R. humilis*, in accordance with the increased length of the tail; these two members in mammals being usually in strict proportion to each other—the longer the tail the longer the hind feet, and *vice versa*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.
1418 ¹	2282	♂	Petaluma, Cal	E. Samuels.....	.....	Skin .....	.....	.....	.75	2.08	2.25	2.33	.....	.....	.70
1583 ¹	2411	.....	do.....	do.....	.....	do.....	.....	.....	.83	1.83	2.25	2.33	.....	.....	.....
1419 ¹	2283	.....	do.....	do.....	.....	do.....	.....	.....	.83	2.25	2.42	2.60	.....	.....	.....
2581			do.....	do.....	.....	In alcohol..	.35	.70	.90	2.15	2.50	.....	.25	.65	.....
2582			do.....	do.....	.....	do.....	.35	.69	.86	2.15	2.45	.....	.30	.65	.....
2583			do.....	do.....	.....	do.....	.40	.80	.95	2.10	2.80	.....	.32	.68	.....
2584			do.....	do.....	.....	do.....	.35	.73	.90	2.10	2.40	.....	.26	.60	.....
2585			do.....	do.....	.....	do.....	.35	.70	.90	2.13	3.15	.....	.20	.70	.....
2586			do.....	do.....	.....	do.....	.30	.65	.84	2.00	2.35	.....	.25	.63	.....
2587			do.....	do.....	.....	do.....	.40	.73	.90	2.30	2.65	.....	.30	.66	.....
2588			do.....	do.....	.....	do.....	.40	.70	.90	2.00	2.60	.....	.30	.63	.....
2589			do.....	do.....	.....	do.....	.40	.80	.90	2.40	2.88	.....	.31	.65	.....
2590			do.....	do.....	.....	do.....	.38	.79	.90	2.10	2.70	.....	.30	.66	.....
2591			do.....	do.....	.....	do.....	.38	.70	.89	2.20	2.65	.....	.30	.60	.....
2708 ²			San Francisco, Cal.....	Capt. Rodgers, U. S. N....	50	do.....	.40	.72	.88	.....	2.70	.....	.26	.63	.....

¹ Measured before skinning.² Collected by W. Stimpson.

There is a small mouse, described by Audubon and Bachman, under the name of *Mus carolinensis*, which appears different from *Reithrodon humilis*, but in the grooved incisors seems to belong to the same genus. They mention it as existing very sparingly in the maritime districts of South Carolina, and found usually in low grounds, partially inundated. The description is as follows :

REITHRODON CAROLINENSIS.

Mus carolinensis, AUD. & BACH. J. A. N. Sc. Phil. VIII, 11, 1842, 306.—IB. N. Am. Quad. III, 1854, 332.

Hesperomys carolinensis, WAGNER, Wiegman. Archiv, 1843, 11, 51.

SP. CH.—Upper fore teeth slightly grooved ; tail, half an inch longer than the body ; ears long ; color, light plumbeous ; under parts and hind feet scarcely lighter.

Point of nose, lips, chin, fore feet, and nails, white ; whiskers, dark brown. A narrow fawn-colored ring round the eye. Ears, legs, and tail, light ashy brown. Fur on the back and sides uniform light plumbeous ; the under surface scarcely a shade lighter.

	Inches.	Lines.
Length of head and body	2	4
tail	2	9
Height of ear .....	.....	4
Length of tarsus .....	.....	6½

The grooved incisors distinguish this species from the common mouse, and the *Hesperomys leucopus* ; from the other North American Reithrodons the dark color of the belly and hind feet constitute a decided characteristic.

HESPEROMYS, Waterhouse.

Hesperomys, WATERHOUSE, Zool. of Beagle, 1839, 75.

WAGNER, Suppl. Schreb. III, 1843, 510.

BURMEISTER, Thiere Brasiliens, I, 1854, 162.

Form, generally murine; tail variable, scant haired. Molars diminishing from first to last; elongated, the sides indented, the crowns with a single longitudinal furrow. Young; teeth with a double longitudinal series of tubercles; when worn, the molars, with angular indentations of the enamel, more or less elongating.

The typical North American species of this genus have the general appearance of *Mus*, with their long tails, large ears, and quick movements. They have, however, a more hairy tail, and the anterior molar teeth have only two tubercles in the transverse series, or two series of tubercles longitudinally inserted, instead of three, as in the genus *Mus*.

Most of the species have white feet, and the tail whitish, with a darker stripe above. They vary in the size and hairiness of the ears, the length of the feet and tail, and in the color. There is not much variation in the skull.

The genus *Hesperomys*, as above constituted at the head of this article, is of very great extent, embracing a large proportion of the American *Muridae*. It is, properly, the type of the division of *Sigmodontes*, the general remarks respecting the latter applying more particularly here than to the other genera.

Within the limits as assigned above to *Hesperomys* there are considerable variations of greater or less importance which induced Waterhouse, the chief authority in respect to the American Murines, to establish several sub-genera for the South American species, based upon the variation in the folding and pattern of the enamel, the comparative length of the snout, tail, feet, and fur, and the existence of claws or nails on the thumb of the hand. Finding, however, that the characters derived from this feature cannot be relied on in all cases, even for specific differences, and that the others mentioned seemed more or less intangible, our author, after erecting the genera *Scapteromys*, *Oxymycterus*, *Habrothrix*, *Calomys*, and *Phyllotis*, subsequently combined them all into one genus, *Hesperomys*, which has been adopted by most writers. There are, however, sufficient grounds for arranging the South American species of this genus with sub-genera, corresponding in the main with those originally given by Waterhouse, excepting that, as suggested by Wagner, *Oxymycterus* and *Scapteromys* may be conveniently combined, as also *Habrothrix* and *Phyllotis*. This would leave three sub-genera, for which, with Burmeister, the names *Calomys*, *Habrothrix*, and *Oxymycterus*, may be retained. Burmeister, however, makes *Holochilus*¹ another sub-genus of equal rank, differing from Wagner and Waterhouse, who give to it full generic rank with *Hesperomys*, *Reithrodon*, &c.

¹ HOLOCHILUS, Brandt.

WAGNER, Suppl. Schreb. III, 1843, 518.

Holochilus, BRANDT, Mem. Acad. Imp. Sc. St. Pet. (VI Series,) III, 1835, 428.

BURMEISTER, Thiere Bras. I, 1854, 162.

General appearance rat-like. Upper lip not completely split, hairy above. Tail long. Molars short, broad; last upper molar as long as the first; inner side of the central lower molar with two indentations.

In size the species of this genus equal the large rats, the body of one measuring nine inches. The upper lip, instead of being fissured to the nose, has its upper portion hairy, with the exception of a little fold of skin below. The molars are very large, the third upper as long or longer than the second, and equal to the first. The genus differs from *Hesperomys*, which has the teeth becoming smaller from before behind, in lacking this progression. The relationships to *Sigmodon* are

The following features may serve to characterize the above sub-genera, the last of which, at least, is probably entitled to higher rank.

CALOMYS, Waterhouse.

Calomys, WATERHOUSE, Pr. Zool. Soc. Lond. V, 1837, 21.

WAGNER, Suppl. Schreb. III, 1843, 524.

BURMEISTER, Thiere Bras. I, 1854, 168.

Eligmodontia, F. Cuv. Ann. des Sc. Nat. 1837, 168.

Form highly murine. Tail as long or much longer than the body. Eyes and whiskers large. Upper border of the orbit sharp, extending backwards as a ridge along the side of the cranium. Indentation of the enamel of the molars considerable; posterior molar moderate.

The species of this section are very mouse-like, both in shape and size, although almost always white on the belly, feet and under surface of the tail. The fur is long and very soft, with still longer but soft hairs interspersed. The head is pointed, the ears large and coated with very short hairs. The elongated tail is coated with short hairs, so as usually more or less to conceal the annuli. The hind feet are long and generally correspond in this respect with the tail, both being longer or shorter together.

The skull is rather full, with the nose elongated. The upper border of the orbit is sharp and continuous, with a blunt ridge, which passes back along the junction of the temporal and parietal bones to the occipital. The enamel folds are rather narrow and parallel sided, and the teeth generally exhibit the characters described under *Sigmodontes*.

HABROTHRIX, Waterhouse.

Habrothrix, WATERHOUSE, Pr. Zool. Soc. V, 1837, 25.

WAGNER, Suppl. Schreber, III, 1843, 516.

BURMEISTER, Thiere Bras. I, 1854, 178.

Form arvicoline. Eyes and whiskers small. Tail and feet short; the former with short hairs. Ears well furred. Skull elongated. Edges of orbit rounded. Indentations of enamel short. Posterior molar very short. Thumb with a nail.

The species of the sub-genus *Habrothrix* bear a close external resemblance, except in the sharp snout, to the Arvicolas, and, in fact, would seem to represent them in South America. The eyes are small. The ears are quite large, broader than high, and well covered with hair. The muzzle is long and pointed; the whiskers short and scanty. Tail shorter than the body, rather densely coated with hair. Tail and feet shorter than in *Calomys*. Thumb of fore foot with a broad flat nail, instead of a claw, as in *Oxymycterus*.

The skull is narrow and elongated, the muzzle especially so; the upper edges of the orbit not sharp, but rounded off. The malar bone is shorter and less curved than in *Calomys*. The lower incisors are narrower; the posterior nearly circular upper molar is decidedly smaller. The enamel folds penetrate less deeply, and the molars, when half worn, do not exhibit any isolated enamel islands on the grinding surface. The fur is soft, the longer hairs projecting less than in *Calomys*, and the color is of a more homogeneous grayish.

Scapteromys differs in having a claw to the thumb, all the fore claws long, the molars also slightly different.

very close, extending apparently to the very pattern of the enamel loops; an appreciable distinction, however, is to be found in the comparative lengths of the molars.

No species of *Holochilus* have yet been detected in North America. Its affinities appear very close with *Sigmodon*.

OXYMICTERUS, Waterhouse.

Oxymycterus, WATERHOUSE, Proc. Zool. Soc. V, 1837, 30.

WAGNER, Suppl. Schreb. Säug. III, 1843, 513.

BURMEISTER, Thiere Bras. I, 1854, 182.

Form, Lemming-like. Eyes and whiskers small; tail and feet short. Claws very long and sharp; thumb with a distinct claw. Muzzle prolonged into a trumpet-shaped tube. Central molar in either jaw with only one indentation on each side; the very small posterior molar with none at all.

Where *Habrothrix* represents the Arvicolas, according to Burmeister, the species of *Oxymycterus* bear the same relation to the Lemmings, as far as the stout body, short tail and feet, long claws, and the distinct claw on the thumb of the fore foot extend, instead of a broad nail, as in *Calomys* and *Habrothrix*. The muzzle is very large and pointed, more so than in *Habrothrix*; but like it, the fur is short, with the coarse hairs projecting but slightly; eyes small and the whiskers feeble. The ears are well furred. The soles are naked from the heel. The edge of the intermaxillary is prolonged into a tube completed by the elongated nasal bones widening at the end, somewhat like a trumpet. The incisive foramina extend back between the molars; the ante-orbital foramen is small. The upper edges of the orbit are much rounded, the forehead broader between the orbits than in *Calomys*, the nasal bones extending much further back. The molars have short wide folds when worn, somewhat similar to those of *Arvicola*, without any enamel islands.

A careful comparison of the species of the *Sigmodont* group of North and South America is quite sufficient to show that, with the same general characters, the minor conditions vary throughout. I have not had, as yet, the opportunity of examining more than one South American species; but judging from this, and from the very accurate figures and descriptions of Waterhouse, Wagner, Burmeister, and others, I consider it entirely probable that a very critical and extended investigation will show that even the genera, much more the sub-genera, are entirely different.

A striking feature of the North American vesper mice, to anglicise Wagner's name, is their diminutive size compared with the South American. Many species of the latter are fully equal to the rats, or even larger, some of them, as *Holochilus*, with still larger teeth. Scarcely one of our species exceeds four inches to the root of the tail in the flesh, while most are the size of the common house mouse or less. The South American *Reithrodons* have a body six inches in length, so stout and full, and the head so large and much arched, that one species has been called *R. cuniculoides*, rabbit-like. The tail, also, does not exceed half the length of the body. Our species, on the contrary, are the smallest of our mice, scarcely more than half the size of the house mouse, which they otherwise closely resemble in shape and proportions. The tail is as long as the body alone, or else longer than the head and body together. The shape and character of the skull are quite different.

The only one of the South American subdivisions of the genus *Hesperomys* to which our North American animals even approximate is *Calomys*. Even here the South American species are mostly of large size, only a few as diminutive as the largest of ours. None of the divisions of *Habrothrix*, *Scapteromys*, *Oxymycterus*, or *Phyllotis*, not to mention *Holochilus*, are represented in any North American species.

It then becomes necessary to seek for some other arrangement for the North American vesper mice, and this is readily indicated by an examination of the species now known to naturalists in which sub-generic distinctions, as well defined as those of the South American, can easily be found. I have satisfied myself of the existence of four groups, readily distinguishable by

external characters. Two of these differ only in the presence or absence of hair on the soles, and may, perhaps, be best considered as one; the third is similar in skull, but differs in external characters; the fourth is so distinct as perhaps to be worthy of generic separation.

The molar teeth appear to be very similar in all, decreasing regularly from anterior to posterior, each about two-thirds the length of its predecessor in the upper jaw, the disproportion rather less in the lower. The enamel folds are much more superficial than in the South American species, so much so as to render it difficult to detect any particular pattern of indentation. When the crowns wear plane, instead of loops we see usually only a slightly irregular border of enamel encircling the dentine as a single island. The posterior upper molar is nearly circular, and very small; it has no appreciable indentations whatever; the middle molar has one median internal, and two rather obscure external, and one at or near each end; the third has two alternating indentations on each side. In the South American specimen referred to, the indentations, even in the much worn teeth, are as deep and as distinct as in *Arvicola* or *Neotoma*; those of opposite sides of the same tooth are opposite each other, and almost touch; there are two on each side the anterior, and one median on each side of the middle and posterior, thus presenting a very different appearance. How constant this may be I cannot say, but Waterhouse's figures of skulls represent the same thing in nearly all the South American species. These differences in the teeth may be tabulated as follows:

	North American.	South American.
Indentations of enamel of opposite sides of the upper molars -----	Alternating-----	Opposite -----
Outside of middle molar, with-----	Two indentations-----	One -----
Posterior molar-----	Small; circular, with scarcely a trace of indentation.	Larger, subquadrate, with a deep indentation on either side.

It is very possible, however, that some South American species may be more like ours in the character of the skull, especially the species of *Habrothrix*.

The first group embraces species most similar in form to the South American, especially to *Calomys*. Here the size is very small, none exceeding four inches in the flesh to the root of the tail. The ears are large, with short close hair; the tail is two-thirds the length of the body or else a little longer. The belly and feet are generally white; the bright fulvous above of many South American mice is only faintly represented in one or two species, their golden yellow under parts, never. The soles in one division are hairy to the tubercles, which are usually six in number; in the other division the soles are entirely naked. The tubercles are all large and conical; the posterior one especially. The claws are all short and weak; the hinder longest. The hind feet are longer in proportion than the fore; the hand half the length of the hind foot. The bristly hairs of the back are soft, and only a little longer than the under fur, so that they are but little conspicuous.

The skull has the superior edge of the orbit rather sharply angular, but not provided with a raised crest or bead, such as is described in the South American species. In the smaller of these, however, this crest is said to be wanting, as it is in a skull before me from Chile, in which the orbital edge is only sharper than in our species. The molar teeth already described are much the same in all the North American groups, and bear a close relationship (judging from descrip-

tions) to those of *Habrothrix*, as does the skull likewise. Indeed, it may be said that the species of the group resemble *Calomys* in external form, and *Habrothrix* in skull and dentition.

As already stated, this group is divisible into two, one with the soles hairy behind the tubercles, the other with the soles entirely naked. The two are very similar in other respects.

Although a new sub-generic name might with all propriety be made for this section, I shall not attempt it now in my ignorance as to how far some of the smaller and least studied South American species may share the same characters. At the same time, however, I shall not be at all surprised to find that neither this nor any other section of vesper mice has any direct representatives on the continent of South America.

The second division resembles the *Arvicolae* somewhat in external characters. The eyes are large, the ears rather small; the fore limbs are stout and powerful, compared with the hinder, which are much shorter in proportion than in the preceding group. The fore feet are two-thirds the length of the hinder; the claws of all the feet very long, the anterior considerably longest. The thumb, however, is rudimentary, with a nail. The tail is less than half the length of head and body, very thick at base, and tapering rapidly to an attenuated tip, well covered with soft appressed, not bristly, hairs. The soles have but four tubercles, lacking the two posterior ones of the preceding group. The sole is very densely furred to the tubercles, and consequently much beyond what is seen in the preceding section, or two-thirds instead of one half. This furring, too, is much closer and fuller; in fact, somewhat resembling that of the hares, with almost as long a staple in proportion. The fur is soft; the bristly hairs projecting but slightly. The skull presents few differences from the preceding division, except that the muzzle and inter-orbital spaces are broader, the incisive foramina shorter and much more open, and the teeth rather broader.

In some respects this group resembles *Habrothrix*, especially in teeth, but differs in having the muzzle broad and short rather than slender and long, as compared with *Calomys*. The long fossorial claws, much longer anteriorly than posteriorly, are not found in *Habrothrix*, which also has the sole nearly or quite naked, with black tubercles, as in *Sigmodon*. From *Scapteromys* it is distinguished by the thumb nail, not claw, and by the character of the molars. The name of *Onychomys* may be applied to it, as referring to the long claws. There is but one species thus far known: the *Hypudaeus leucogaster*, of Maximilian, or the *Mus missouriensis* of Audubon and Bachman.

The third and last group has *Hesperomys palustris* as its typical, and, as far as known, its only species. Here the characteristics are very strongly marked. The general appearance is that of *Sigmodon* or even of *Arvicola*, from both of which, the tail considerably longer than head and body, will at once distinguish it. The fur, though lustrous, is yet very coarse externally, owing to the great predominance of the bristly hairs, which are double the length of the others. The hair generally is longer and much coarser than in the other divisions, only less so than in *Sigmodon*. The ears are comparatively small, not longer than the adjacent fur. The hind feet are very long, especially the toes, which are inserted obliquely, as in *Fiber*. The soles are perfectly naked, with six tubercles, which are all very small, except the posterior, which is narrow, linear, and very long, as in *Mus*. The skull in most respects, the teeth especially, is as in the preceding sections; a very striking difference, however, is seen in the upper margin of the orbit, which is extended into a sharp, compressed crest, passing backwards and sinking on the temporal region. This is seen also in *Sigmodon*, and is the character described as existing in the large South American *Hesperomys*. The posterior margin of the bony palate is consider-

ably posterior to the last molar, (twice its length,) and there is quite a deep fossa between the corners of the palatine notch and the posterior molar. In our other *Hesperomys* the palatine notch extends as far as the line of the molars, and the fossa just mentioned does not exist. In the skull of the South American *Hesperomys* referred to, the notch is posterior to the molars, as in the present group. For this group, with its many distinctive features, I would propose the name of *Oryzomys*.

I will now sum up, in brief terms, the principal characteristics of these different groups, and then proceed to the discussion of the several species.

HESPEROMYS, Waterhouse.—Form mouse-like. Tail not less than the body without the head, sometimes longer. Claws weak; hind legs and feet long, the latter with six large conical tubercles; soles naked, or less than half hairy. Upper margin of the orbit sharp, but not extended into a crest.

ONYCHOMYS, Baird.—Form arvicoline. Tail less than half the head and body. Claws very large, fossorial, the anterior longest. Soles with only four tubercles, the two posterior of the other groups wanting; the posterior two-thirds of the soles densely furred. Skull without orbital crest; the upper margin of the orbit sharp.

ORYZOMYS, Baird.—Form rat-like. Ears nearly buried in the fur. Hairs of body coarse. Tail longer than head and body; the hairs longest on the under surface. Hind feet very long. Soles naked, with six tubercles, all very small except the posterior, which is very long and narrow. Upper margin of the orbit raised into a compressed crest, as in *Sigmodon*.

The following synopsis may serve to show the relationship of the North American species of *Hesperomys* as restricted above. In all, except when otherwise stated, the belly and feet are of a more or less pure white.

A.—SOLES HAIRY BEHIND THE TUBERCLES.

a.—Tail nearly, or about as long as the head and body; hind feet long, exceeding .75.

1. Tail distinctly bicolor.

- | | |
|--|------------------|
| 1. Above yellowish brown, with a broad well defined wash of darker along the back. Ears dusky brown, with the extreme edge only hoary..... | <i>leucopus.</i> |
| 2. Above reddish brown, with darker hairs, but no distinct dorsal stripe. Outside of fore leg like the back? Ears smaller than in the preceding, dusky, without any hoary edging?..... | <i>texanus.</i> |
| 3. Above yellowish brown, with dark hairs, but no distinct dorsal stripe. Outside of fore leg white? Ears very large..... | <i>gambelii.</i> |
| 4. Fur very soft and full. Above sooty brown, relieved, especially on the sides, by a little yellowish brown. Outside of fore leg dusky | <i>austerus.</i> |
| 5. Color light cinnamon red; a tinge of the same on the belly. Ears dusky cinnamon | <i>nuttalli.</i> |

2. Tail scarcely lighter beneath (shorter than in section 1.)

- | | |
|---|--------------------|
| 6. Larger than <i>H. leucopus</i> . Above rusty yellow, with a dark dorsal band. Hind foot .90..... | <i>gossypinus.</i> |
| 7. Smaller than <i>H. leucopus</i> . Above yellowish brown, with a dusky dorsal band. Ear dusky, without any light edge. Hind foot about .85..... | <i>cognatus.</i> |

b.—Tail bicolor, considerably longer than head and body; the end with a long pencil of hairs.

8. No cheek pouches? Tail three quarters of an inch longer than body. Body above yellowish brown. Outside of fore leg to carpus like the back.....

boylii.

9. With cheek pouches. Tail a quarter of an inch longer than head and body, or more. Above dusky cinnamon red; beneath white. Outside of fore leg white. Young, dusky.....

myoides.

c.—Tail but little longer than the body without the head; bicolor.

10. Larger than the preceding. Hind feet long; exceeding .80. Tail shorter. Above ashy gray, with a little yellowish brown on the sides. No dusky dorsal stripe. Feet pure white.....

sonoriensis.

11. Hind feet very short; never exceeding .75, usually under .70. Color above dusky brown, with a little yellowish on the lower part of the sides. A distinct darker dorsal wash. Feet dusky except the toes

michiganensis.

B.—SOLES PERFECTLY NAKED.

12. Tail longer than head and body; scarcely lighter beneath. Size nearly of half grown rat. Above sooty brown, passing into fulvous on the lower part of the sides

californicus.

13. Similar to preceding, except not half the size. Above grayish yellow, with a fulvous lateral stripe.....

eremicus.

The remaining species of the *Hesperomys* group are:

14. *Onychomys leucogaster*.

15. *Oryzomys palustris*.

HESPEROMYS LEUCOPUS.

White-footed Mouse--Deer Mouse.

Mus sylvaticus, var. ERXLEBEN, Syst. An. I, 1775, 390. (Referring to Pennant's New York variety.)

Mus sylvaticus, var. *noveboracensis*, FISCHER, Synopsis, 1829, 318.

Mus agrarius americanus, KERR, Linnaeus, 1792, 231. (From Pennant.)

Musculus leucopus, RAFINESQUE, Am. Month. Mag. III, 1818, 446.

Mus leucopus, DESMAREST, Mamm. II, 1822, 307.

HARLAN, F. Am. 1825, 151.

GRIFFITHS, Cuv. V, 1827, 233.

FISCHER, Synopsis, 1829, 326.

DEKAY, N. Y. Zool. I, 1842, 82; pl. xxiii, f. 1.

AUD. & BACH. N. Am. Quad. I, 1849, 300; pl. xlv.

KENNICOTT, Agric. Rep. U. S. Patent Office, 1856 (1857), 90; plate x.

Hesperomys leucopus, LECONTE, Pr. A. N. Sc. Phil. VI, 1852, 413.

Mus agrarius, GODMAN, Am. N. H. II, 1828?

LINSLEY, Am. Jour. Sc. XLII, 1842, 351.

Mus noveboracensis, SELYS LONGSCHAMPS, Etudes de Micromammalogie, 1839, 67.

? *Hesperomys maniculatus*, WAGNER, Wiegmann's Archiv, 1843, II, 141.—IB. 1845, II, 148.—IB. Abhand. K. B. Akad. der Wissensch. V, II, 1848, 316, (or Denkschriften, XXII.)

Arvicola emmonsii, DEKAY, in Emmons' Rep. Quadrupeds of Mass. 1840, 61.

American field mouse, PENNANT, Syn. 1771, No. 303.

? *Field rat*, PENNANT, Hist. Quad. 1781, No. 302.—IB. Arctic Zool. I, 1784, 131.

? *American wandering mouse*, BARTON, Phila. Med. & Surg. Journal, I, 1805, 31. (Notice of great migratory droves on the north side of Lake Erie. May possibly refer to *H. myoides*.)

Sp. Ch.—Young, dark slaty plumbeous. Adult, yellowish brown; most usually a broad and well defined dorsal wash of darker. Tail pure white beneath. Tail nearly as long as head and body. Posterior tubercle of sole large, elongated. Soles hairy for less than half their length. Ears with the edge only lighter. Maximum size of body, in the flesh, 3.60; hind feet, .75 to .85. Maximum of skull, 1.05 inches; in one instance, 1.07.

This animal is considerably larger than the common domestic mouse, the head and body broader also in proportion. The more varied colors, longer and softer fur, larger ears and eyes, and external appearance generally, give to it a much more attractive appearance than that presented by the house mouse. In localities where the latter species has not yet penetrated, it often takes up its abode in dwellings and out-buildings, infesting the premises and doing all the petty mischief for which the other species is so well known.

The head of this animal is rather broad in proportion to its length. The muffle is entirely hairy to the extremity, both above and below, the septum and region around the nostrils alone being naked. The hair even extends in an obtuse angle a little way on to the septum, but not reaching the level of the nostrils. The nostrils are elliptical, and partly visible from the side. The septum is rather wide, with a single median separating furrow, which passes directly into the deep fissure of the upper lip. This fissure extends as far as the nose, becoming more and more shallow. No traces of cheek pouches can be detected. The ears are large and rounded. There is a long low antitragus, which, however, does not appear at all valvular, as in *Jaculus* and perhaps *Reithrodon*. It is thinly coated with hairs on both sides, except around the meatus.

The thumb of the fore finger is a very rudimentary callosity, covered with a broad flat nail exactly resembling that on the human hand. The third finger is longest; the fourth but little shorter; the second and fifth successively shorter still. The proportions of the hind toes are much like those of the fingers; the first toe is, however, longer, its claw not reaching quite to the penultimate articulation of the second toe. The palms are naked, with five large nearly equal tubercles, which nearly cover them; the soles have six tubercles, the anterior five quite similar in size and position to those of the hands, the posterior single one placed a little anterior to a point midway between the heel and the bases of the toes. The soles are covered with short hairs from the heel to near the first tubercle. This character will always serve to distinguish the white-footed mouse from the common domestic mouse, in which the entire under surface of the sole is perfectly naked.

The tail is a little shorter than the head and body; very rarely attaining the same size or longer; it is rounded, tapering to a rather blunt tip; its surface covered with whorls of scales, between which spring short hairs, partially concealing them; the tail appearing considerably more hairy than in the domestic mouse.

The colors of this animal vary very considerably with age. The most perfect pelage of the fully adult specimens is of a light yellowish brown color on the back and sides; the middle of the back, along a space about the width of the head between the ears, having a wash of darker, owing to a predominance of blackish tips to the hairs; these tips are also seen on the sides, but in less amount. In some specimens there is a faint indication of a lateral stripe of quite bright rusty yellowish extending on to the cheeks. The under parts and insides of the limbs, with the upper surfaces of the feet, are pure cottony white. The line of demarcation between the colors of the belly and sides commences at the upper incisors, passes backward under the eye, over the shoulders, and along the middle of the sides to the outer edge of the hind legs. The outer surface of the hind legs, exclusive of the feet, is always colored like the

back; the outside of the arm is sometimes pure white below the shoulders, sometimes with a dusky tinge, sometimes colored like the back nearly to the wrist. The under surface of the tail is always conspicuously whiter than the upper.

Young specimens, again, differ considerably from the above description; even after they have attained their full size they may be of a plumbeous gray above, darker on the middle of the back, sometimes with the faintest possible wash of brown on the sides. The under parts are snowy white, but the plumbeous bases of the hairs show through, somewhat obscuring the brilliancy of color in places. The boundaries of the colors are, however, the same as in the adult, except that the outside of the fore leg down to the wrist is usually lead-colored. The change of color generally begins on the lower part of the sides in the assumption of a more yellowish tint, which gradually extends towards the middle of the back, the top of the head and nape being the last to change. The extreme edge of the ear is usually whitish, more conspicuous than in the adult.

The adult colors do not appear to be assumed for some time, perhaps several months or more. I cannot establish any particular relationship between color and season, all the shades being found in every month.

I have taken the white-footed mouse of Massachusetts as my type in describing the species on account of the very large series of specimens on hand received from Mr. Jenks, and representing all the variations of age, sex and season. In comparing with these some skins from Nova Scotia, probably identical with the Labrador species, called *Hesperomys maniculatus* by Wagner, I find little, if any, appreciable difference. They appear rather smaller, the ears, perhaps, a little larger, and the upper parts of the young have a grayish cast instead of a plumbeous, somewhat as in the Upper Missouri species. The tail is, however, long, as in *H. leucopus*, and the feet of the same character.

On examining the extensive table of measurements of the white-footed mouse it will be seen that, as a general rule, the tails are always longer than the body, exclusive of the head, generally a little less than the total length, in a very few instances about one-third of an inch longer. The length of the hind foot also varies from .75 to .85, never less than the former in full grown specimens; the more usual length is .80.

Notwithstanding the similarity in external form between the white-footed mouse and the house mouse, there are certain points of difference externally, in addition to the generic ones derived from the skull and teeth. Thus the ears and eyes are considerably larger, the head broader and more pointed, the feet and their toes longer, and the tubercles much larger; the heel is hairy, instead of perfectly naked; the tail is more hairy; the strong contrast of the white belly and feet and under surface of the tail are never seen in the house mouse.

The resemblance between *Mus sylvaticus* of Europe and the present species is quite close, although a simple examination of the skull and teeth will at once settle the question. The *M. sylvaticus*, in some of its varieties, is considerably larger, though not usually so; and, as Audubon and Bachman very justly state, the colors are much less vivid, the tail and ears shorter, the white of the under surface does not extend so high on the sides, and there is a yellowish spot, edged with dusky on the breast, never seen in *H. leucopus*.

This species, for a long time, was considered to be the same as *Mus sylvaticus* of Europe, or at best but a local variety; as is now well known, however, they are not even of the same genus.

The first applicable name is that of Rafinesque, and although nearly all the species published

at the same time by him are palpably wilful fabrications, either of his own or of some one imposing upon his credulity, the *Musculus leucopus* is sufficiently applicable to be retained.

Judging from the color and the extreme shortness of tail, I am inclined to believe that Richardson's species is the *Hesperomys sonoriensis*, var. *nebrascensis*.

The *Mus noveboracensis* of Selys is an excellent description of the present species.

The *Hesperomys maniculatus* of Wagner is based on specimens from Labrador, which appear to be the same as those from Halifax. Should these not be the same with *H. leucopus*, from Middleboro' and elsewhere, then the name will be retained; otherwise it must be reduced to a synonym. His comparisons were made chiefly with Richardson's description of what I consider to be a different species; and besides this, one strong point of distinction was supposed to be the hairy heels of the new species, those of *H. leucopus* being erroneously supposed by him to be naked.

The American wandering mouse of Barton refers probably either to this species or to the *H. myoides*. The *Mus leucopus* of Thompson is a good description of *H. myoides*, his original specimen and type being now No. 833 of the Smithsonian collection.

List of specimens.

Catalogue number.	Corresponding number of skulls.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Width of skull.	Height of ear.
1373	.....	.....	Halifax, N. S.	.....	Dr. J. B. Gilpin	Skin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2460	.....	.....	do.	.....	do	do	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1358	.....	.....	do.	.....	John Downes	Mounted	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2743	.....	♂	Hingham, Mass.	.....	T. M. Brewer	In alcohol.	.53	.90	1.15	3.65	3.35	3.53	.40	.82	.....	.....	.66
895	1944	♂	Middleboro' Mass.	September	J. W. P. Jenks.	Skin	.....	.....	1.25	3.50	3.33	3.60	.....	.....	1.05	.54	.....
893	1942	♂	do.	do.	.....	.....	.....	.....	1.17	3.17	2.17	2.33	.....	.....	1.03	.51	.....
891	1940	♂	.....	do.	.....	.....	.....	.....	1.08	2.75	3.25	.....	.....	.....	.....	.....	.....
896	1945	♂	.....	do.	.....	.....	.....	.....	1.08	3.00	2.50	2.60	.....	.....	.96	.....	.....
897	1946	♂	.....	do.	.....	.....	.....	.....	1.08	3.25	2.50	2.66	.....	.....	1.01	.....	.....
753	1938	♂	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.04	.54	.....
875	1926	♂	.....	May	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.94	.....	.....
876	1927	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.07	.....	.....
894	1943	♂	.....	September	.....	.....	.....	.....	1.17	2.93	2.42	2.50	.....	.....	.....	.....	.....
878	1929	♂	.....	May	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.90	.....	.....
1434 ¹	.....	.....	.....	Mar. 29, 1856	.....	.....	.....	.....	1.17	3.50	3.25	3.42	.....	.....	.....	.....	.....
827	1988	♂	.....	September	.....	.....	.....	.....	1.17	3.75	3.33	3.50	.....	.....	.....	.....	.....
1105	.....	.....	.....	November 9.	.....	.....	.....	.....	.....	4.50	3.40	.....	.....	.....	.83	.....	.....
1112	.....	.....	.....	do.	.....	.....	.....	.....	.....	4.30	2.90	.....	.....	.....	.80	.....	.....
2713	.....	.....	.....	Aug. and Sep.	.....	In alcohol.	.55	.95	1.16	3.55	2.83	.....	.36	.80	.....	.....	.....
2714	.....	.....	.....	.....	.....	.....	.50	.92	1.14	3.41	.....	.....	.35	.83	.....	.....	.....
2715	.....	.....	.....	.....	.....	.....	.50	.90	1.14	3.13	3.25	.....	.36	.80	.....	.....	.....
2716	.....	.....	.....	.....	.....	.....	.50	.90	1.14	3.30	3.00	.....	.58	.80	.....	.....	.....
2717	.....	.....	.....	.....	.....	.....	.50	.91	1.14	3.35	3.15	.....	.35	.81	.....	.....	.....
2720	.....	.....	.....	.....	.....	.....	.50	.90	1.14	3.30	3.10	.....	.34	.80	.....	.....	.....
2721	.....	.....	.....	.....	.....	.....	.52	.94	1.19	3.45	3.10	.....	.40	.83	.....	.....	.....
2722	.....	.....	.....	.....	.....	.....	.51	.93	1.15	3.30	3.16	.....	.36	.80	.....	.....	.....
2723	.....	.....	.....	.....	.....	.....	.49	.89	1.12	3.00	3.00	.....	.36	.78	.....	.....	.....
2724	.....	.....	.....	.....	.....	.....	.49	.88	1.11	2.95	2.75	.....	.36	.79	.....	.....	.....
2725	.....	.....	.....	.....	.....	.....	.50	.95	1.10	3.15	3.12	.....	.38	.80	.....	.....	.....
2726	.....	.....	.....	.....	.....	.....	.52	.94	1.15	3.50	3.21	.....	.40	.78	.....	.....	.....
2727	.....	.....	.....	.....	.....	.....	.54	1.02	1.19	3.45	3.38	.....	.....	.85	.....	.....	.....

¹ These measurements, as of all in the column, 895-827, were taken before skinning. The same specimen after being skinned measured to root of tail 4.30; tail, 3.00; hind foot, .82.

List of specimens.

Catalogue number.	Corresp'g No. of skulls.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.								
						Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Height of ear.
2777			Middleboro', Mass.	J. W. P. Jenks	In alcohol.	.52	.90	1.17	3.40	3.30	3.53	.34	.82	.60
2778			do.	do.	do.	.52	.98	1.25	3.45	3.30	3.50	.34	.83	.61
2779			do.	do.	do.	.51	.90	1.16	3.42	3.26	3.41	.33	.81	.57
2780			do.	do.	do.	.52	.95	1.16	3.25	3.25		.34	.81	
2781			do.	do.	do.	.51	.90	1.16	3.39	3.50	3.70	.33	.80	.55
2782			do.	do.	do.	.52	.95	1.16	3.36	3.05		.33	.81	.57
2783		♂	do.	do.	do.	.59	.99	1.20	3.55	3.10	3.26	.35	.81	
2784		♂	do.	do.	do.	.51	.90	1.15	3.08	3.34		.33	.85	.55
2785			do.	do.	do.	.50	.87	1.10	2.95	2.70		.31	.78	.50
2786		♂	do.	do.	do.	.49	.83	1.05	3.05	2.61		.32	.77	.49
2787			do.	do.	do.									
2788		♂	do.	do.	do.	.50	.89	1.10	3.25	2.90		.31	.78	
2789			do.	do.	do.	.50	.90	1.14	3.01	2.90		.31	.77	
2790		♂	do.	do.	do.	.48	.80	1.02	2.92			.27	.77	
2824		♀	Wethersfield, Con.	C. Wright	do.									
2792			Nichols, N. Y.	R. Howell	do.	.51	.95	1.19	3.50	3.08		.36	.82	.61
2733			do.	do.	do.	.54	.98	1.22	3.55	3.20		.38	.82	.65
2734			do.	do.	do.	.50	.89	1.12	3.25	3.04		.35	.78	.60
2735			do.	do.	do.	.46	.85	1.08	2.97	2.46		.33	.77	.52
2741			Sag Harbor, L. I.	E. N. Byram	do.	.55	.99	1.20	3.62	2.90		.39	.86	.59
2742			do.	do.	do.	.46	.87	1.05	2.70	2.24		.32	.78	.52
2738			West Philadelphia, Pa.	W. S. Wood	do.	.54	.94	1.18	3.43	2.85		.38	.80	.62
2739			do.	do.	do.	.51	.92	1.16	3.40	2.67		.35	.75	.60
2736			Mount Joy, Pa.	J. Stauffer	do.	.51	.94	1.18	3.25	2.98		.35	.78	.61
2737			do.	do.	do.	.49	.87	1.10	2.94	2.60		.35	.77	.57
598	1721		Carlisle, Pa.	S. F. Baird	do.			1.17	3.25	2.83	2.93			
2773		♂	Clark county, Va.	Dr. Kennerly	In alcohol.	.52	.94	1.15	3.00	2.50	2.75	.31	.71	
2774		♂	do.	do.	do.	.55	.98	1.20	3.32	2.84	3.06	.38	.82	
2775			do.	do.	do.	.59	.89	1.12	2.92	2.65		.35	.80	
2560			Pembina, Minnesota.	C. Cavileer	do.	.50	.90	1.10	2.90	2.20		.38	.70	
547	1666	♀	Fort Ripley, Minnesota.	Dr. J. F. Head, U. S. A.	Skin.									
991		♀	Racine, Wis.	Dr. Hoy	In alcohol.									
2752			do.	A. C. Barry	do.	.51	1.01	1.10	3.06	2.40		.36	.77	.48
2753			do.	do.	do.	.45	.88	1.09	3.03	2.46		.37	.78	.50
2731			West Northfield, Ill.	R. Kennicott	do.	.55	.96	1.22	3.32	3.07		.37	.80	
2747			do.	do.	do.	.52	.92	1.15	3.35	3.32		.37	.92	
2748			do.	do.	do.	.51	1.00	1.15		2.70		.34	.82	.60
821			Cleveland, Ohio.	Dr. Kirtland	Skin.									
2749			Salem, Ohio.	Judge Newton	do.	.55	.95	1.18	2.90	3.05		.35	.78	.65
2750			do.	do.	do.	.52	.92	1.15	3.25	3.30		.40	.85	
2751			do.	do.	do.	.52	.95	1.15	3.20	3.10		.38	.85	
510	1645		St. Louis, Mo.	Dr. Engelmann	do.									

HESPEROMYS TEXANUS, Woodhouse.

Hesperomys texana, WOODHOUSE, Pr. A. N. Sc. Phila. VI, Feb. 1853, 242.—IB. Sitgreaves' Rep. Exp. Zuffi, &c. 1853, 48; pl. ii. Mammals.

Arvicola (*Hesperomys*) *texana*, AUD. & BACH. N. Am. Quad. III, 1854, 319.

SP. CH.—Size and proportions about as in *H. leucopus*. Ears small; tail rather shorter than head and body. Color above, reddish brown; brighter than in *H. leucopus*, and more like *H. aureolus*, but darker. No conspicuous wash of dusky on the back. Feet, belly, and under surface of tail pure white. Outside of fore leg like the back?

I find it very difficult to characterize this species as distinct from *H. leucopus*, although it is very probable that the two are different. The proportions of the limbs are quite similar, although the posterior tubercle of the sole appears smaller and further back. The sole is densely hairy from the heel to this tubercle. The tail is rather shorter than the head and body. The ears are rather smaller than usual. The general color above and on the sides is a reddish brown, brighter than in *H. leucopus*, or more like *H. aureolus*. The tint is quite uniform throughout, there being no indication of darker on the back, as in the other. The under parts and feet are pure snowy white, the tail decidedly bicolor. The young are of much the same general plumbeous above as in *H. leucopus*.

From the list of references it will be seen that the species at present is only recorded as found in the lower parts of Texas and along the Rio Grande to El Paso.

List of specimens.

Catalogue number.	Corresp'ing No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—		
								Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore feet.	Length of hind feet.		Length of skull.	Width of skull.
2559	.....	...	Western Texas.....	.....	Capt. L. Sitgreaves	....	Skin in al.	.50	...	...	...	2.40	...	.35	.78	...	...	Dr. Woodhouse.
2654	.....	...	Fort Bliss, N. Mexico.	.....	Dr. S. W. Crawford	....	In alcohol.	.50	.91	1.18	3.40	2.84	...	.38	.82	...	...	.....
?145	1127	...	El Paso, Texas.....	.....	Col. J. D. Graham.	....	Skin	....	...	...	3.75	2.92	3.05	...	.80	1.00	...	J. H. Clark.....
1736	.....	○	Western Texas.....	.....	Capt. Pope	....	do.....	....	...	...	...	...	...	...	...	...	...	.....
1734	.....	○	Waco Tanks, N. Mex.	Oct. 3, 1855	do.....	143	do.....	....	...	...	...	...	...	...	...	...	...	.....
448	1582	♂	Pecos to Rio Grande..	1853....	Cpt. A. W. Whipple	....	do.....	....	...	...	...	...	...	...	...	...	...	Dr. Kennerly...
1037	2217	...	Turkey Creek, Texas.	Nov., 1854	Major Emory.....	....	Mounted	....	...	...	...	...	...	...	1.10	.55	...	do.....
1038	.....	...	do.....	do.....	do.....	....	In alcohol.	.43	.85	...	2.05	...	.35	.72	...	...	do.....	.....
579	1702	...	Chaco Escondido, Mex	Mar., 1853	Lt. D. N. Couch....	....	Skin.....	....	...	...	2.79	2.65	...	...	.80	...	...	.....
	1802	...	Brownsville, Texas..	.....	Capt. Van Vliet...	....	Skull.....	....	...	...	...	...	...	...	...	...	...	.....

HESPEROMYS GAMBELII, Baird.

SP. CH.—Very similar to *H. leucopus* in size and proportions. Feet perhaps shorter. Ears larger. Tail generally less than head and body, sometimes a very little longer. Above, yellowish brown, much mixed with dusky, but without a distinct broad wash of darker on the back. The entire outside of the fore leg below the shoulder, white?

Body stout. with long fur. Ears very large, thinly coated with short hairs; the antitragus distinct. Fore feet rather large, hind feet small. Tail shorter than the body, scarcely reaching beyond the ears when bent over; the hairs only slightly elongated at the tip. One specimen (369) with 24 caudal vertebrae.

Color.—Above, mixed glossy brown and yellowish brown, the former predominating on the back. Sides but little paler. Ears dusky. The white of the fore leg extending as far as the elbow. Under parts and feet white. Tail white, dusky above; the difference of color very evident.

Several specimens of *Hesperomys* were caught at Posa Creek by Dr. Heermann, differing in some respects from the others brought in from the west by exploring parties. As they appear not quite grown, I hesitate about describing them as new, and, for the present, at least, prefer to place them under *H. gambelii*.

This species differs from *H. boylii* in the much shorter tail and less number of caudal vertebræ, more villose ears, with longer fur at their inner base on the top of the head, shorter hind feet, &c.

This species, in size and general appearance, represents very closely the *Hesperomys leucopus* of the eastern States to such a degree, in fact, that as yet I have not found any easily expressed characters to distinguish them. There is the same plumbeous hue in the young, the yellowish brown of the back, &c. I do not find, however, a tendency to a distinct darker stripe on the middle of the back, as in *H. leucopus*, and the general appearance of a series of each is quite different. It is barely possible that my *H. austerus* may be a northern variety of the common Californian species, of smaller size and darker color, somewhat like the gray and smaller *H. leucopus* of Nova Scotia, and probably Labrador. The differences, however, are considerable, and further materials will be necessary to decide the question.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen	Measurements.										Collected by—	
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.	Length of skull.	Width of skull.		Ht. of ear anteriorly.
663	1844	Naches Pass, Cascade mountains, W. T.	July 1, 1854	Gov. I. I. Stevens	....	Skin....	....	....	....	3.50	2.85	3.00	....	.77	....	....	.65	Dr. J. G. Cooper.
7810	2012	Astoria, O. T.	.....	Lt. Trowbridge	....	do....	....	....	....	4.00	3.65	3.80	....	.84	....	....	.63	.....
7998	2224	Fort Dalles, O. T.	Feb., 1855.	Dr. Geo. Suckley	42	do....	....	....	....	3.83	....	3.67	....	.80	....	....	....	.....
1262	....	Klamath lake, O. T.	.....	Lt. Williamson	....	Mounted.	....	....	....	3.25	....	....	....	.75	.96	.50	.55	Dr. Newberry.
2561	....	Petaluma, Cal.	.....	E. Samuels	....	In alc.	.49	.86	1.03	2.76	2.52	....	.33	.75	....	....	....	.....
2562	....	do.	.....	do.	....	do.	.45	.85	1.05	2.50	2.64	....	.36	.80	....	....	....	.....
2563	....	do.	.....	do.	....	do.	.44	.80	1.02	2.50	2.30	....	.34	.75	....	....	....	.....
2564	....	do.	.....	do.	....	do.	.52	.92	1.12	3.10	2.80	....	.40	.80	....	....	....	.....
2565	....	do.	.....	do.	....	do.	.52	.92	1.12	3.28	2.75	....	.38	.80	....	....	....	.....
2566	....	do.	.....	do.	....	do.	.47	.83	....	....	....	....	....	....	....	....	....	.....
2567	....	Temales bay, Cal.	.....	do.	....	do.	.50	.90	1.10	3.10	3.20	....	.32	.78	....	....	....	.....
2568	....	do.	.....	do.	....	do.	.45	.80	1.07	....	2.88	....	.30	.80	....	....	....	.....
2569	....	do.	.....	do.	....	do.	.46	.89	1.04	2.75	2.82	....	.32	.78	....	....	....	.....
2570	....	do.	.....	do.	....	do.	.45	.78	.95	2.25	2.00	....	.30	.75	....	....	....	.....
284	....	San Francisco, Cal.	Winter	R. D. Cutts	....	Skin	....	....	....	....	2.70	2.80	....	....	....	....	.55	.....
368	1282	Monterey, Cal.	.....	Lt. Trowbridge	....	Mounted.	....	....	....	3.60	2.68	....	....	.75	1.00	....	.55	.....
369	1283	do.	.....	do.	....	do.	....	....	....	3.50	3.20	....	....	.80	1.00	.52	.56	.....
476	1601	Posa creek, Cal	.....	Lt. Williamson	5	do.	....	....	....	....	....	....	....	....	.90	....	....	Dr. Heermann.
477	....	do.	.....	do.	4	do.	....	....	....	2.75	2.25	....	....	.80	....	....	....	do.
478	1602	do	.....	do	7	do.	....	....	....	....	....	....	....	....	....	....	....	do.

¹ Possibly *H. boylii*.

HESPEROMYS AUSTERUS, Baird.

Hesperomys austerus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 336.

SP. CH.—Fur very full and soft; rather smaller than *H. leucopus*; feet larger in proportion.

Young, dark slaty plumbeous. Adult, almost sooty brown, slightly pervaded by yellowish brown on the cheeks and lower part of sides, the dusky of the sides extending, even in the adult, to the wrist; both feet above and under parts white; tail well haired, as long as head and body, lower half white.

This species is of rather small size and of darker color than any of the North American species, except *H. michiganensis*, from which it may always be distinguished by the longer tail and hind feet.

There are no distinguishing peculiarities in the character of the head. The feet are large, the tubercles of the soles also larger than in *H. leucopus*, the posterior one elongated; the soles are hairy from the heel to the posterior tubercle, the anterior end of which is just half way between the heel and the ends of the balls of the toes. The thumb is not so rudimentary as in the *H. leucopus*, and covered by a pretty large nail.

As far as can be judged, the tail is rather shorter than the head and body, not very stout at the base.

The fur of this species is very dense and full, more so than in almost any other species. The prevailing color above is a smoky brown, with a faint grayish yellow tinge on the cheeks and sides, rather more vivid on the former. The colors of the back and sides, however, extend down to the very wrist. The feet and under half of the tail, with the under parts generally, are quite pure white. The tail is well coated with hairs, so as to conceal the annuli. The ears are large, brown, with the edges grayish white, in decided contrast.

The young are of a nearly uniform dark slaty plumbeous above and on the sides, without a dorsal stripe of darker. This color also extends plainly down to the wrist.

As already stated, the longer feet and tail distinguish this species from *H. michiganensis* of Illinois. Neither is there any dusky spot on either fore or hind feet. The dark colors of the back are mixed uniformly, shading imperceptibly on the sides, instead of forming a distinct broad dorsal stripe.

Compared with the Upper Missouri species the color is much darker and the tail considerably longer. *Hesperomys leucopus* is much larger and has not the sooty tinge; its tail, also, is rather shorter.

Two specimens of *Hesperomys* (2577, 2578) in alcohol, from Steilacoom, exhibit some quite peculiar features among the genus, and very probably constitute an undescribed species. I shall not, however, venture to name them, as the material is not sufficient for a full and satisfactory description. They have much the appearance of the domestic mouse, but are really *Hesperomys*. A striking peculiarity is seen in the extreme brevity of the hind foot, which in 2578 measures but .70 of an inch. The tubercles are all much larger than in the other *Hesperomys*; the feet broader; the digits shorter and more nearly equal. The sole is densely hairy to the first tubercle. The tail is about as long as head and body; scantily haired, without concealing the annuli, and but little lighter below than above; the colors in very slight contrast. The back appears to be dark brownish, the belly and feet yellowish white. One of the specimens is a suckling female.

The *Hesperomys austerus* has thus far only been found in the eastern part of Washington Territory.

List of specimens.

Catalogue number.	Corresp'ng No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—	
								Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore feet.	Length of hind feet.		Length of skull.
229			Spokane Plain, W. T.	Oct. 31, 1853	Gov. I. I. Stevens.	11	Skin				3.00	2.80	3.00				Dr. J. G. Cooper.
1964	.....	.....	Steilacoom, W. T.	Mar. 15, 1856	Dr. Suckley	86	...do.....	.....	.....	.....	3.50	3.40	3.50	.....	.82	.....	
363	1277	.....	...do.....	.....	...do.....	22	Mounted.....	.....	.....	.....	.....	.....	.....	.....	.....	.95	
364	1278	.....	...do.....	.....	...do.....	5	...do.....	.....	.....	.....	3.00	2.85	2.90	.....	.79	.....	
365	1279	.....	...do.....	.....	...do.....	.....	...do.....	.....	.....	.....	3.10	2.50	.....	.....	.75	.88	
371	1285	.....	...do.....	.....	...do.....	4	...do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
916	1967	♀	...do.....	.....	...do.....	.....	Skin .....	.....	.....	1.00	2.75	3.08	3.25	.....	.82	.95	
2576	.....	.....	...do.....	.....	...do.....	.....	In alcohol.	.52	1.00	1.18	.....	3.20	.....	.48	.80	.....	
2577	.....	.....	...do.....	.....	...do.....	.....	...do.....	.46	.87	1.02	2.67	2.76	.....	.33	.72	.....	
2578	.....	.....	...do.....	.....	...do.....	.....	...do.....	.54	1.00	1.20	3.10	3.20	.....	.34	.70	.....	
2579	.....	.....	...do.....	.....	...do.....	.....	...do.....	.40	.70	.86	1.80	1.38	.....	.27	.60	.....	
2580	.....	.....	...do.....	.....	...do.....	.....	...do.....	.35	.68	.83	1.85	1.50	.....	.28	.56	.....	

HESPEROMYS NUTTALLI.

Red Mouse.

Arvicola nuttalli, HARLAN, Monthly American Journal, April, 1832, 446.—*IB.* Med. & Phys. Res. 1835, 55; plate.

Mus (Calomys) aureolus, AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 302.—*IB.* N. Am. Quad. II, 1851, 303; pl. xcv.

Hesperomys aureolus, WAGNER, Wiegmann's Archiv, 1843, II, 51.

SP. CH.—Size and proportion of *H. leucopus*. General color bright yellowish cinnamon; darker on the lower part of the back. Ears cinnamon. Feet and under portion of the tail white; on the latter, however, not sharply defined; belly reddish white, tinged with cinnamon, the line of demarcation quite indistinct; the outside of fore leg colored to the wrist.

This species is about the size of the *H. leucopus*, which it otherwise resembles very closely. The head, however, appears shorter and considerably broader. The feet are short, the tubercles large and much crowded together; more so than in *H. leucopus*; the tubercles themselves considerably larger, the toes shorter. The soles are densely covered with very short hairs, shorter and more velvety than in *H. leucopus*. The tail is cylindrical and about as long as the head and body; it is covered closely with short hairs.

The upper parts and sides of this species are of a bright reddish yellow, a light yellowish cinnamon will perhaps best express the tint; or in some cases yellowish rusty; the lower part of the back and rump darkened by black tips to the hairs, but without forming a distinct dorsal stripe. The color is brightest on the sides of the shoulders, and extends all the way to the wrist; the cheeks are only less bright than the shoulders. The ears are cinnamon; both membrane and hairs being of this color. The feet are white above, as is the inferior half of the tail; the under parts generally are of a yellowish white, strongly tinged in places with cinnamon. There is nothing of the sharp line of division of the colors of the belly and sides seen in *H. leucopus*. The cheeks are cinnamon almost to the edge of the upper lip, involving appreciably more of the face than in *H. leucopus*.

HESPEROMYS GOSSYPINUS, Leconte.

Cotton Mouse.

Hesperomys gossypinus, LECONTE, Pr. A. N. Sc. Phila. VI, Oct. 1853, 411.

Hypudaeus gossypinus, LECONTE, M. Murtries Cuvier, I. 1831. App. (No. desc.)

SP. CH.—Larger than *H. leucopus*. Tail considerably shorter than the head and body; above, rusty yellowish brown, brightest on cheeks, a dorsal wash of darker. Beneath, ashy white. Tail scarcely, if at all, lighter below than above. Hind foot from heel .90.

In size this animal considerably exceeds the specimen described of *H. cognatus*, though the essential characters appear the same. The ears are large and thin; higher than broad; entirely dusky. The upper parts are of rather a rusty yellowish brown, the median portion of the back darker. The under parts are dull ashy white; the feet are grayish white. The tail is brown above, passing beneath into a dark ashy brown, little, and in one specimen not at all, different from the upper part. The dull brownish rusty on the cheek is more clear than elsewhere.

I am hardly satisfied that this animal is different from the smaller *H. cognatus*, as the difference in size is no greater than is to be seen in series of *Hesperomys* from more northern localities. The tail is still duskier beneath than in *H. cognatus*, and the sides more rusty; otherwise, I can realize only the larger size. Should both prove to be the same, the name *H. gossypinus* must, of course, take precedence.

There is every reason to consider this mouse as specifically distinct from *H. leucopus* of the north; although skins, when much stretched, (as Nos. 1105, 1112, from Middleboro', Massachusetts,) of the latter, may measure as much as those recorded here, yet they are certainly actually smaller, as shown by the feet, which never attain anything of the length of .45 for the anterior and .90 for the posterior.

List of specimens.

Catalogue number.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.					
				Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Ear, height.
546	Riceboro', Ga.....	Major J. Leconte	Skin	4.56	2.65	2.70	.45	.90	.60
1361	South Carolina.....	William Cooper	..do.....	4.00	2.35	2.40	.....	.90	.....

HESPEROMYS COGNATUS, Leconte.

? *Hesperomys polionotus*, WAGNER, Wiegmann's Archiv. 1843, II, 52. (Georgia.)

Hesperomys cognatus, LECONTE, Pr. Phila. Acad. Nat. Sciences, VII, Dec. 1855, 442.

SP. CH.—Smaller than *H. leucopus*. Tail considerably shorter than head and body. Young, slaty plumbeous. Adult, yellowish brown, with a dorsal wash of darker. Under parts and feet soiled white or light ashy. Under surface of tail, ash gray, not conspicuously different from the dorsal color. Ears without hoary edging.

This species is a very near relative of the *Hesperomys leucopus* of the north, but differs by quite appreciable characters. In size it is considerably inferior to the last mentioned species,

though resembling it in form. The ears are large and very thin, scantily covered with short hairs, so as to appear almost naked. Their color is a uniform dusky, without any white edging. The fore feet appear rather longer in proportion than usual. The hinder are, however, quite long, and their soles are covered with hair from the heel to near the first tubercle, which is elongated, as in *H. leucopus*. The thumb is more developed than in *H. leucopus*, with a larger nail.

The colors of this animal are somewhat like those of *H. leucopus*, but duller. The upper parts are of a yellowish brown, darkened along the back by a preponderance of black tips to the hairs. The under parts and feet are of a soiled white, (in one specimen light ash colored.) The tail above is brownish; beneath, it is ashy gray, without the strong contrast of color seen in the *H. leucopus*.

Young specimens from Mississippi have the same lead-colored tinge as seen in immature *H. leucopus*.

The principal points of difference from *H. leucopus* have already been adverted to, consisting in the uniformly dusky ears and less purity of white beneath. The lack of contrast between the colors of the upper and under surfaces of the tail is also a striking feature. All these characteristics, if not specific, indicate a very decided and easily recognised variety.

The *Hesperomys polionotus* of Wagner, in all probability, refers to this same species, especially if the only small *Hesperomys* in Georgia be the subject of the present article.¹ The description speaks of the small size, the whitish, not white, belly, and the ungrooved incisors. By the omission to speak decidedly in regard to the color of the tail, we may conclude that this is not bicolor. Still, as there is an uncertainty in the case, it may be well to retain Major Leconte's name, until the question can be more definitely settled.

List of specimens.

Catalogue number.	Corresp'g No. of skulls.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.									
						Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Height of ear.
2810	.....	....	Tarboro', N. C.	J. L. Bridger	In alcohol..	.49	.73	1.17	2.94	2.05	2.19	.32	.73	.....	.48
673	1845	....	Hillsboro', N. C.	Rev. M. A. Curtis	Skin .....	.....	.....	.....	3.00	2.35	.....	.35	.75	1.00	.45
905	.....	....	Society Hill, S. C.	do	do .....	.....	.....	.....	3.20	2.50	2.55	.....	.82	.....	.50
562 ¹	1683	○	Oxford, Miss.	Col. Wailes	do .....	.....	.....	.93	2.25	1.42	.....	.....	.70	.....	.....
583 ¹	1706	....	Washington, Miss.	do	do .....	.....	.....	1.17	3.50	2.50	2.60	.....	.85	1.05	.....
586 ¹	1709	.....	do	do	do .....	.....	.....	1.17	3.42	2.75	2.83	.....	.87	.....	.....
.....	.....	....	Columbus, Georgia.	Dr. Gesner	In alcohol..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	....	New Orleans	J. Varden	do .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

¹ Measured before skinning.

¹ The description is as follows: "Supra flavido—plumbeus; subtus, pedibusque albidis; auriculis mediocribus; dentibus primoribus integris; cauda pilosa, abbreviata." Body, $2\frac{1}{2}$ inches; tail, $1\frac{3}{4}$; ears, $\frac{1}{2}$; hind feet, $\frac{1}{2}$. Hab. Georgia.

HESPEROMYS BOYLII, Baird.

Long-tailed Mouse.

Hesperomys boylii, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.

Sp. CH.—Body stout. Ears very large, with very scant hairs, appearing almost naked. Tail stout, considerably longer than the body, with long hairs at the end, (and 32 vertebræ?) Above, mixed brown and yellowish brown; paler on the sides. The outside of fore leg colored to near the wrist.

This species is rather larger than *H. leucopus*, and is quite distinctly marked in other respects among the North American *Hesperomys*. The head is broad, and the snout quite acute and pointed; the whiskers longer than the head. The ears are very large, and appear naked on both surfaces, especially the exterior, but a close examination shows them to be thinly coated with a very fine short pile; the antitragus is almost obsolete. The tail is cylindrical, and considerably longer than the body; the hairs are moderately close, and slightly elongated towards the tip. The feet are moderate, the hinder ones rather long. The under surface of the metatarsi is thinly coated with short hairs. The fur is everywhere full and soft, and the general bulk greater than in most other species.

The upper parts are of a mixed glossy brown and pale yellowish brown, the former predominating on the back and thighs, the latter on the sides, still brighter on the outside of the fore leg and the side of the head. The lower parts and feet are white, the fore feet, with a brownish tinge; the color of the sides reaches nearly to the carpus. The white of the sides is bordered above by a suffusion of reddish buff, which melts insensibly into the color of the upper parts. The outside of the fore leg is colored nearly to the wrist. The tail is white, with the upper side dusky, though the line of separation of the two is not as distinct as in some species.

The specimen upon which this species was founded was collected by Dr. C. C. Boyle, in Eldorado county, California, on the middle fork of the American river. It had 32 caudal vertebræ, while a specimen from Monterey, of *H. californicus*, had but 24. It is the very appreciably greater length of the tail that distinguishes the two species at first sight.

A specimen from Shoalwater Bay, collected by Dr. Cooper, has the tail still longer than the preceding.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.							
						Nose to accip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Ear, above notch.
356	1270	.....	Middle Fork, Am. riv., Cal...	Dr. C. C. Boyle.....	Mounted...	1.25	5.25	3.80	4.08	.31	.85	1.09	.60
578	1701	♀	Shoalwater bay, W. T.....	Dr. J. G. Cooper.....	Skin.....	1.08	3.08	4.08	4.17	.....	.95	1.05	.....
810*	.....	.....	Astoria, O. T.....	Lt. Trowbridge.....	do.....	.....	4.00	3.65	3.80	.....	.84	.....	.....

* These measurements were taken before skinning. The dried specimen measures to root of tail 3.40; the tail to end of hairs 4.05.

* Possibly *H. californicus*.

HESPEROMYS MYOIDES.

Hamster Mouse.

Cricetus myoides, GAPPER, Zool. Jour. V, 1830, 204; tab. x.

? *Mus leucopus*, THOMPSON, Nat. Hist. Vt. Appendix, 1853, 13.

? *Hesperomys gracilis*, LECONTE, Pr. A. N. Sc. Phila. VII, Dec. 1855, 442.

SP. CH.—Size of *H. leucopus* or larger. Tail vertebrae generally .25 of an inch longer than head and body, with a decided pencil at the end. Jaws with moderate cheek pouches. Color above, cinnamon brown, lined with dusky; ears and upper part of tail, similar. Under parts and feet, pure white, the color extending over the whole fore leg. Immature specimens fuscous, much as in *H. leucopus*.

My attention was first called to this species by noticing that all the white-footed mice from near Burlington, Vermont, had much longer tails in proportion than those from Middleboro', Massachusetts. It then occurred to me to see if the former were in any way related to the *Cricetus myoides* of Gapper, and, much to my astonishment, I found decided indications of cheek pouches in all the alcoholic specimens examined. I then investigated a considerable number of Middleboro' specimens, and in none could I detect the slightest indication of anything of the kind.

These pouches are not very deep in the alcoholic specimens, as might naturally be expected from the highly contractile character of their walls. In fresh specimens, according to Gapper, they extend to the ear; here, however, they only reach back as far as the posterior edge of the eye, or about .30 of an inch from the edge of the mouth. They open on each side of the fleshy palate, between the incisors and the molars, and pass obliquely backwards. The walls are thickened and corrugated, probably by immersion in alcohol; naked, or with a scattered hair here and there. In the bottom of one were a few bits of a blackish substance.

In external appearance there is very little to distinguish this species from *H. leucopus* from Middleboro'. The ears are very similar, except, perhaps, a little narrower and higher, and less rounded above. The antitragus is long and quite well developed. The nose and feet are precisely similar, except, perhaps, that the tubercles of *H. myoides* are larger. The tail only is generally longer than the head and body instead of being shorter. It has also a long pencil of hairs at the tip.

I fear I shall find it quite difficult to define this species so that it will be recognized without anatomical examination. The colors, however, differ in some points from those of *H. leucopus*, resembling more those of *H. aureolus*. I have never seen so vivid a yellowish brown in *H. leucopus* as pervades the upper parts of *H. myoides*. There is more or less of a dusky band along the back, not so conspicuous, perhaps, as in *H. leucopus*. In the only two adult or red-colored specimens before me the membrane of the ear and the upper part of the tail, instead of being fuscous brown, are yellowish or cinnamon, a feature not seen in the other. In the more plumbeous or grayish young, however, this character is inappreciable. The entire under parts of body and tail and the feet are snowy white, the line of demarcation passing high up on the sides, leaving the whole outside of the fore leg white.

More immature specimens, instead of the yellowish brown, are more fuscous, as in the *H. leucopus*, the dusky color extending even to the wrist.

As far as I can discern there is nothing whatever in the skull and teeth of this species in any way different from that of *Hesperomys leucopus*. It bears no resemblance to that of *Cricetus*, and as the only common character lies in the mutual possession of cheek pouches, it

will not be proper to place the species in this genus. Unaccompanied by any other features of external form or internal structure, the presence or absence of a cavity in the mouth can scarcely be looked on as other than specific characteristics merely.

The description and figures by Dr. Gapper, in the Zoological Journal, agree very well with the specimens before me. He speaks of the species as abundant in the district of Upper Canada between York and Lake Simcoe. The tail of his specimen measures $3\frac{1}{2}$ inches; the body, (probably stretched,) $3\frac{3}{4}$.

For an excellent specimen of this species the Institution is indebted to the Montreal Natural History Society.

In another specimen, 2776, from Waterville, New York, referable probably to the same species, I found the cheeks crammed with large seeds, and on cutting them open could see that the latter occupied a pouch of considerable size. It is possible, indeed, that this specimen (immature) may not belong to the *H. myoides*; if so, we must conclude that in the ability to distend the cheeks very much, even temporarily, the *H. leucopus* approaches very closely to the *H. myoides*, and this diminishes still more the propriety of placing the latter in a distinct genus. It is quite possible that others of our species may have cheek pouches more or less developed.

The *Hesperomys gracilis* of Major Leconte, from Ohio, agrees very well in length of tail with this species, and otherwise resembles one of the Burlington specimens. It is, however, in the dried specimen, impossible to ascertain whether cheek pouches were ever present or not. The tail vertebræ measure 3.60 inches, 3.70 with the hairs; the body (stretched) is about 3.70. The hind feet, .85. In the length of tail, so much greater than what is usual in *H. leucopus*, I have little hesitation in referring it to the *H. myoides*. The specimen came from Michigan or northern Ohio.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Height of ear.
983 ¹			La Prairie, near Montreal, Canada.	Montreal N. H. Society	46	Mounted ..	.60	.....	1.23	4.20	3.76	4.16	.....	.85	.67
833 ²			Burlington, Vt.	Prof. Z. Thompson	.....	Skin .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21312 ³	2113	♂	do ..	do ..	.....	.....do ..	.....	.....	1.17	3.00	3.00	.....	.....	.....	.....
1313 ³	2114	♂	do ..	do ..	.....	.....do ..	.....	.....	1.17	3.50	3.90	4.25	.....	.....	.....
2741			do ..	do ..	.....	In alcohol.	.....	.....	.....	.....	.....	.....	.....	.....	.....
2742			do ..	do ..	.....	.....do ..	.....	.....	.....	.....	.....	.....	.....	.....	.....
2743			do ..	do ..	.....	.....do ..	.....	.....	.....	.....	.....	.....	.....	.....	.....
2744		♂	do ..	do ..	.....	.....do ..	.50	.87	1.11	2.95	3.03	3.28	.35	.78	.64
2745		♂	do ..	do ..	.....	.....do ..	.51	.88	1.10	2.94	3.15	3.31	.36	.75	.60
2746		♂	do ..	do ..	.....	.....do ..	.49	.85	1.06	2.70	2.72	2.83	.38	.83	.60
2776			Waterville, N. Y.	H. Davis	.....	.....do ..	.50	.81	1.09	2.98	3.15	3.42	.37	.78	.....

¹ Measured after being mounted.

² Original of Thompson's description of *Mus leucopus*.

³ Measured before skinning.

HESPEROMYS SONORIENSIS, Leconte.

Hesperomys sonoriensis, LECONTE, PR. A. N. Sci. Phila. VI, October, 1853, 413. (Sonora.)

Arvicola (Hesperomys) sonoriensis, AUD. & BACH. N. Am. Quad. III, 1854, 296, (from Leconte.)

? *Mus leucopus*, RICH. Zool Jour. III, 1828.—IB. F. B. Am. I, 1829, 142.

SP. CH.—Young, light ash gray; adult, with a tinge of yellowish brown; in neither is there any dorsal stripe. Tail scarcely longer than the body, exclusive of the head. Posterior tubercle of sole small, rounded, far forward. Soles hairy for half their length. Tail white, except a narrow line above of dusky. Ears large, with long hairs; one-half of the ear hoary, in strong contrast with the dusky of the remaining portion.

This species has the general characters of the white-footed mouse of the eastern States; and it is only after the comparison of extensive series that I have been able to detect differences which, though slight, are so constant and of such a character as to appear something more than a mere local variation. I shall, however, be obliged to indicate the differences rather by comparison than as absolute characters.

The hands, feet, and tail are considerably stouter than in eastern white-footed mice; the second finger is longer. The tubercles of the soles are smaller, especially the hinder one, which is a simple, small rounded cone, instead of an elongated eminence. This, too, is situated considerably more forward, its base anteriorly being about half way from the heel to the end of the balls of the toes, instead of less. The soles are more hairy, too, the hairs covering fully half the sole from heel to balls of toes, or as far as the posterior tubercle.

The tail is very thick and quite short in its proportions, scarcely longer than the body, exclusive of the head. It is unusually thick and densely hairy, so as to conceal the annuli and junction of the vertebræ, even in the dried specimen.

The distribution of color in this animal is much as in the *Hesperomys leucopus*. The tints, however, are considerably different. Most specimens are of an ash gray, finely lined with black, nearly uniform all over the whole back, without forming a dorsal band. The under parts, with the feet, are very pure white. The hairs on the concavity of the ears are unusually long and of a hoary gray; the margin of the back of the ear is also of this color, forming a strong contrast to the dark brown of the remaining portion. In *Hesperomys leucopus* the hairs are shorter, with little or none of the hoary. The colors of the tail are in a very strong contrast, the dorsal dusky being quite intense and much more restricted than in the other species, occupying scarcely one-third of the entire circumference, instead of nearly one-half.

In some specimens there is a slight tinge of yellowish in the ash gray of the upper parts. This is, however, not so vivid as in the other species. I have seen no specimens of a dark slate color. The specimens of *Hesperomys*, upon which the preceding description has been based, are from the upper Missouri.

Although I have not the slightest doubt that this species is distinct from *H. leucopus*, I have been unable to decide whether it is different or not from the mouse from Sonora, characterized as *H. sonoriensis* by Major Leconte from specimen 146 of the Smithsonian collection. This was, however, not quite mature, and more perfect specimens, collected by Dr. Henry at Fort Thorn, enable me to give the peculiarities of the animal with more precision, as follows:

SP. CH.—Size larger than *H. leucopus*. Body stout. Ears very large, rather densely coated with long appressed hoary hairs. Tail much shorter than the body or about two-thirds this length. Tarsi short. Above, mixed gray, lead color and yellowish brown, without any reddish tints whatever.

Size larger than that of the typical *Mus leucopus* of the east. Fur soft and short. Body very stout and full. Ears very large and broad, the outer surface covered with depressed hairs on their posterior half. Tail unusually short, scarcely reaching to the occiput when bent over the back; the vertebræ very stout and tapering rapidly to the tip. Hind feet rather short.

The prevailing color above is a mixed gray, dark brown, and pale yellowish brown; the dark brown predominating on the back, the gray on the sides. The single hairs on the back are dark lead color, with a light grayish end terminated by very faint yellowish brown. On the sides the gray is very distinct, becoming obsolete towards the back. In fact, there is a decided hoary tinge above. The under parts of the body, the feet, including the entire fore arm, and the tail, except a dusky surface above, white. The extreme tip of the tail is formed by white hairs. The ears are dusky, becoming hoary towards their margin on both surfaces.

The young of this species, after immersion in alcohol, are of a rather dark slate color above and on the sides.

It will thus be seen that the general characteristics are very similar, proportions, coloration, &c., the only differences now appreciable being in the considerably larger size of the skins of the Sonora and New Mexican animals. Though this would give some color to a distinction of species, I do not feel authorized to impose a new name without further data, especially as the regions inhabited by the *H. sonoriensis* are, zoologically, very much the same with the Upper Missouri. It is quite possible, too, that if the largest of the Missouri specimens catalogued had been skinned when fresh, and then somewhat stretched in stuffing, they would have been little inferior in size to those from Fort Thorn.

The *Mus leucopus* of Richardson appears to be the same with the *H. sonoriensis*, and if all the other specimens quoted below are the same, it will indicate a very extensive range, from Sonora along the Rocky Mountains and Black Hills to the Saskatchewan, or even further north

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—		
							Nose to eye.	Nose to ear.	Nose to occiput	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.		Length of skull.	Height of ear.
204	1175	.....	St. Mary's, R. Mts....	Oct. 1, 1853	Gov. I. I. Stevens..	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Dr. G. Suckley.
226	.....	.....	Milk river, Neb.....	Aug. 21, '53	do.....	In alcohol.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
2542	.....	.....	.....do.....	Aug., 1855	Dr. F. V. Hayden..	do.....	.57	1.00	1.15	3.28	2.70	.....	.35	.79	.....	.....	.....
2543	.....	.....	.....do.....	do.....	do.....	do.....	.59	1.10	1.17	3.40	2.60	.....	.35	.80	.....	.....	.....
2544	.....	.....	.....do.....	do.....	do.....	do.....	.50	.93	1.13	3.05	2.16	.....	.35	.65	.....	.....	.....
2545	.....	.....	North Yellowstone...	Aug., 1856	Lt. G. K. Warren...	do.....	.58	.91	1.17	3.00	2.50	.....	.40	.85	.....	.....	Dr. F. V. Hayden
2546	.....	.....	.....do.....	do.....	do.....	do.....	.52	.90	1.13	3.00	2.12	.....	.....	.80	.....	.....	.....do.....
2547	.....	.....	.....do.....	do.....	do.....	do.....	.47	.80	.92	2.30	2.03	.....	.....	.65	.....	.....	.....do.....
2550	.....	.....	Upper Yellowstone...	do.....	do.....	do.....	.50	.95	1.15	3.18	2.93	.....	.38	.75	.....	.....	.....do.....
2551	.....	.....	.....do.....	do.....	do.....	do.....	.55	1.00	1.17	3.12	2.40	.....	.40	.84	.....	.....	.....do.....
2552	.....	.....	.....do.....	do.....	do.....	do.....	.50	.95	1.15	3.10	2.46	.....	.40	.74	.....	.....	.....do.....
2553	.....	.....	.....do.....	do.....	do.....	do.....	.50	.90	1.05	2.75	2.25	.....	.30	.78	.....	.....	.....do.....
2554	.....	.....	.....do.....	do.....	do.....	do.....	.50	.90	1.07	2.65	2.00	.....	.40	.77	.....	.....	.....do.....
2555	.....	.....	.....do.....	do.....	do.....	do.....	.55	1.00	1.16	3.00	2.50	.....	.45	.82	.....	.....	.....do.....
2556	.....	.....	.....do.....	do.....	do.....	do.....	.53	1.00	1.13	3.00	2.40	.....	.40	.72	.....	.....	.....do.....
2557	.....	.....	Fort Union.....	do.....	do.....	do.....	.51	.90	1.15	2.66	2.58	.....	.37	.80	.....	.....	.....do.....
1779	.....	.....	Yellowstone.....	do.....	do.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1780	.....	.....	.....do.....	do.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1781	.....	.....	.....do.....	Aug. 6, '56	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1782	.....	.....	.....do.....	Aug. 16, '56	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1783	.....	.....	.....do.....	July 28, '56	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1784	.....	.....	.....do.....	Aug. 16, '56	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
1398	2234	♀	Little Missouri.....	do.....	do.....	do.....	.....	.....	1.00	3.42	2.25	2.42	.....	.....	.....	.....	.....do.....
1399	2235	♂	do.....	do.....	do.....	do.....	.....	.....	1.08	3.42	2.33	2.50	.....	.....	1.03	.....	.....do.....
651	1865	.....	Fort Pierre, Neb....	do.....	Col. A. Vaughan...	do.....	.....	.....	.....	.....	.....	.....	.....	.....	1.06	.....	.....do.....
702	1866	.....	.....do.....	do.....	do.....	do.....	.....	.....	1.17	3.08	2.75	2.93	.....	.....	1.03	.....	.....do.....
703	.....	♀	.....do.....	do.....	do.....	do.....	.....	.....	1.00	2.75	2.25	2.33	.....	.....	.....	.....	.....do.....
1927	.....	.....	North Platte river....	Aug. 21, '56	Lt. F. T. Bryan...	In alcohol.	.45	.73	1.00	2.40	.....	.....	.35	.73	.....	.....	W. S. Wood.
1928	.....	.....	Medicine Bow river..	Aug. 7, '56	do.....	do.....	.50	.87	1.09	2.60	2.20	.....	.35	.73	.....	.....	.....do.....
1932	.....	.....	Engelmann Creek of Rep Fork.	Oct. 13, '56	do.....	do.....	.45	.75	.95	2.19	1.65	.....	.....	.70	.....	.....	.....do.....
1933	.....	.....	.....do.....	do.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	1.04	.....	.....do.....
144	1126	.....	Santa Cruz, Sonora ..	do.....	Col. J. D. Graham.	Skin.....	.....	.....	3.74	2.65	.....	.....	.80	.....	.....	.....	J. H. Clark..
146	1128	.....	.....do.....	do.....	do.....	do.....	.....	.....	3.25	1.93	2.00	.28	.75	.....	.....	.....	.....do.....
147	1129	.....	.....do.....	do.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
9	3209	.....	El Paso, Tex.....	do.....	do.....	Head.....	.....	.....	.....	.....	.....	.....	.....	.....	1.12	.....	.....
542	.....	.....	Fort Thorn, N. M....	do.....	Dr. T. C. Henry...	Skin.....	.50	.....	3.75	2.25	.....	.39	.75	.....	.60	.....	.....
543	.....	.....	.....do.....	do.....	do.....	do.....	.....	.....	3.70	2.20	.....	.....	.76	.....	.....	.....	.....
544	.....	.....	.....do.....	do.....	do.....	do.....	.....	.....	3.80	2.25	.....	.....	.77	.....	.....	.....	.....
545	.....	.....	.....do.....	do.....	do.....	do.....	.....	.....	3.27	2.12	.....	.....	.80	.....	.....	.....	.....

HESPEROMYS MICHIGANENSIS.

Prairie Mouse.

Mus michiganensis, AUD. & BACH. J. A. N. Sc. Phil. VIII, II, 1842, 304.—IB. N. Am. Quad. III, 1854, 326.

Hesperomys michiganensis, WAGNER, Wiegmann's Archiv, 1843, II, 51.

? *Mus bairdii*, HOY & KENNICOTT, Agricultural Report U. S. Patent Office for 1856, (1857,) 92; pl. xi.

SP. CH.—Smaller than *H. leucopus*; ears and feet much smaller and shorter. Above, blackish brown; crown of the head almost black; sides of the adult with an intermixture of grayish yellow brown; a distinct dorsal wash of darker; beneath, snowy white. Upper surface of fore and hind feet dusky to the base of the toes. Tail white beneath. Maximum length of head and body, usually 3.00; tail one inch to half an inch shorter; hind foot seldom exceeding 0.70; never 0.75.

This is, perhaps, the smallest species of *Hesperomys* found within the limits of the United States, and possesses certain characters by which it may be readily distinguished from its allies. The ears and feet are smaller than in *H. leucopus*, the latter conspicuously so; the tubercles of the soles are large; the posterior, however, small and conical, its anterior base posterior to a point half-way from the heel to the balls of the toes. The soles are densely coated with hair from the heel to the posterior tubercles.

The shortness of the hind foot is seen in the approximation of the tubercles of the soles; thus the posterior tubercle is as near to the first anterior on the inner edge as to the first outer, while in *H. leucopus* it is considerably nearer to the first outer.

The tail is short and conical, rather thick at the base; it is but little longer than the body alone—considerably shorter than the head and body together. It is well coated with short hairs, concealing the annuli.

The prevailing color of this species is a dark brown, sometimes almost black in young specimens, always with a distinct stripe of darker, about the width of the head, along the middle of the back. In old specimens there is usually a mixture of yellowish brown on the sides, but the tint is never so conspicuous as in *H. leucopus*. The cheeks often show a rather brighter shade of the same. The ears are dark brown. The dusky of the sides extends beyond the wrist, usually as far as the bases of the fingers; the upper part of the hind feet is also dusky to the toes. The under parts are generally snowy white, the color strongly defined against that of the sides; the tail is dusky above and white beneath. In some specimens the plumbeous base of the fur shows through the white tips, so as to impart an ashy tint.

This species is at once distinguishable from the *H. leucopus* by the much darker color at all ages, the shorter ears and hind feet, and the dusky surfaces of the feet. The dusky specimens of *H. leucopus* are without the broad central wash of darker. The shade of color is much like the dark varieties of *H. austerus*, but in this species there is not the distinct line of darker on the back; the feet are snowy white; the ears and hind feet much larger.

Mr. Kennicott distinguishes a *Mus bairdii* from the *M. michiganensis* by the strong contrast of color between the belly and sides in the former, as compared with the more ashy color beneath, and indistinct separating line in the latter. In the specimens before me are two of larger size than the majority of short dusky-footed ones, and having the characters indicated as belonging to *M. michiganensis*, but I am not able to appreciate any other differences; and the same features are observable in some of the smaller ones. Still, I have much confidence in the judgment of so able a naturalist as Mr. Kennicott, supported as he is by Dr. Hoy. The *M. michiganensis* is said to inhabit open woods near Racine, and not to be found at West Northfield, which is strictly prairie in its character. For the present, however, I shall consider them the same.¹

¹ Since writing the preceding article, I have received a note from Dr. Hoy, in which he says: "I consider the difference between the oak opening deer mouse (*michiganensis*) and the prairie deer mouse (*bairdii*) to consist mainly in the more uniform color, longer tail and larger head of the former, giving to it the look more of the common house mouse than the latter. The *bairdii* has a black stripe on the back; the white belly is separated from the yellowish fawn color of the sides by a distinct line of demarcation."

"One thing is certain—we find one species in the openings, while the other is confined to the prairie; so far, at least, as I have observed."

It is quite possible, after all, that none of the specimens before me belong to the *H. michiganensis*, as restricted by Messrs. Hoy and Kennicott.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Age and sex.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.									
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore feet.	Length of hind feet.	Length of skull.	Height of ear.
989	2020	.....	Racine, Wisconsin.....	.....	Dr. P. R. Hoy.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
? 553 ¹	1673	♀	do.....	.....	do.....	do.....	.50	.83	1.04	3.00	2.17	2.33	.42	.70	.97	.44
2667	.....	.....	do.....	.....	do.....	In alcohol.....	.48	.80	1.00	3.18	2.22	.....	.34	.74	.....	.40
5068	.....	.....	do.....	.....	do.....	do.....	.45	.85	.....	2.82	1.82	1.98	.30	.70	.....	.50
? 2669	.....	.....	do.....	.....	do.....	do.....	.44	.85	.....	.....	.....	.....	.30	.68	.....	.43
650	.....	.....	West Northfield, Ill.....	April 18, 1855	R. Kennicott.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
739	.....	.....	do.....	May 13, 1855	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2756	.....	.....	do.....	.....	do.....	In alcohol.....	.43	.75	.99	2.70	1.70	.....	.35	.68	.....	.44
2757	.....	♂	do.....	.....	do.....	do.....	.48	.82	1.43	3.03	1.92	2.02	.30	.70	.....	.48
2758	.....	♂	do.....	.....	do.....	do.....	.45	.78	1.00	2.95	2.02	.....	.30	.68	.....	.45
2759	.....	.....	do.....	.....	do.....	do.....	.50	.88	1.10	3.20	2.25	2.33	.35	.70	.....	.48
2760	.....	♂	do.....	.....	do.....	do.....	.50	.85	1.05	2.94	2.33	2.45	.32	.71	.....	.48
2761	.....	♂	do.....	.....	do.....	do.....	.46	.78	1.04	2.85	2.20	2.37	.30	.68	.....	.46
2763	.....	♂	do.....	.....	do.....	do.....	.52	.87	1.05	3.43	2.55	2.72	.36	.70	.....	.55
2764	.....	♂	do.....	.....	do.....	do.....	.45	.75	.96	2.92	2.05	.....	.30	.65	.....	.50
2765	.....	♂	do.....	.....	do.....	do.....	.51	.87	1.10	3.20	2.19	2.35	.35	.75	.....	.48
2766	.....	♂	do.....	.....	do.....	do.....	.45	.82	.98	2.90	2.08	2.26	.30	.65	.....	.48
2771	.....	♂	do.....	.....	do.....	do.....	.50	.85	1.08	3.32	2.18	2.32	.32	.70	.....	.....
782	.....	♂	Tremont, Ill.....	.....	W. J. Shaw.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
645 ²	1796	.....	St. Louis, Mo.....	.....	Dr. Engelmann.....	do.....	.....	.....	.84	3.00	1.84	2.00	.....	.....	.95	.....
646 ²	1797	.....	.....	.....	do.....	do.....	.....	.....	1.08	2.93	1.93	2.00	.....	.....	.....	.....
701 ²	1864	.....	do.....	.....	do.....	do.....	.....	.....	.84	2.60	2.00	2.17	.....	.....	.....	.90

¹ Measured before skinning. Fore arm, .55; from elbow to end of claws, .90; longest fore and hind claws, each, .06; from knee joint to end of claws, 1.42; tibia, .83; mammae 4 abdominal, two pectoral.

² Measured before skinning.

HESPEROMYS CALIFORNICUS.

Mus californicus, GAMBEL, Pr. A. N. Sc. Phila. IV, August, 1848, 78, (Monterey.)

Sp. CH.—Very large. Size of third grown rat. Ears very long, angular. Tail rather longer than body. Color above, sooty brown, passing on the sides to fulvous. Under parts white, tinged with fulvous and ashy. Feet white. Tail brown, a littler darker on the dorsal line. Soles entirely naked.

This is one of the largest, if not the largest, of the North American *Hesperomys*, with the exception of the *H. palustris* of Georgia. The ears are enormously large, in this respect certainly exceeding any other species; they are considerably higher than broad, and, instead of being rounded uniformly at the tips, are cut at nearly a right angle with the corners rounded. They are uniformly coated with short white hairs, which do not form a fringe, as on *Neotoma*.

The hind feet have the soles naked from the heel. The tail is considerably longer than the body, very thick and stout, as in the rats. The fur is very soft and full.

The middle of the back of this species is a mixed black and grayish plumbeous, the former greatly predominating; towards the sides there is less black, and light brownish yellow makes its appearance, forming quite a conspicuous stripe on the lower part of the sides, less distinct on the cheeks. The dusky extends to the wrist and heel, though the upper surfaces of the feet are entirely white. The under parts are dull whitish, strongly tinged in places with fulvous,

especially between the arms, while the chin and throat have a more grayish aspect. The tail is brown, only a little darker along the median line.

This animal is more than twice the size of the naked heeled species from Fort Yuma, and is much darker throughout, though in many respects quite similar.

This species inhabits nests of *Neotoma fuscipes*, in Santa Clara valley, composed of sticks, twigs, and leaves, and forming a large mass. On setting fire to these nests, both species rush out together. The precise character of the domestic relations of the two animals is not known. At first the *Hesperomys* was taken by Dr. Cooper to be the young of the *Neotoma*, but an examination clearly revealed the generic peculiarities of each. The feet of the mouse are longer in proportion, especially the toes, and more naked; the tubercles smaller, and the ears larger and differently constituted.

There is little doubt that this is the species briefly indicated by Dr. Gambel in 1848, as no other on the west coast presents anything like the size of body, tail, and ears. It is somewhat to be regretted that the very appropriate name of *parasiticus*, selected by Dr. Cooper to express the habits of the animal, as mentioned above, could not be retained. Dr. Gambel's specimen was taken at Monterey, which thus extends somewhat the known range of the species.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Measurements.								Remarks.	
						Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Width of skull.		Height of ear.
1156	.....	♂	Santa Clara, Cal. ...	Nov. 1855	Dr. J. G. Cooper.	1.35	4.60	4.75	4.80	.52	1.05	.....	.....	.75	Dry skin
1156	.....		.....do.....	do.....	do.....	1.25	4.50	4.75	.....		1.08	.....	.....		Before skinning...
1157	2039	♀	do.....	do.....	do.....	.....	4.50	.....	.....	.....	1.00	1.11	.56	.....	Dry skin
1157	.....		.....do.....	do.....	do.....	.....	4.50	4.00	.....	.....	.....	.....	.....	.75	Before skinning...

HESPEROMYS EREMICUS, Baird.

Desert Mouse.

SP. CH.—Size of *H. leucopus*, or less; ears, very large; tail, considerably longer than the body; fingers and toes, short; color above, grayish yellowish; a pale fulvous band on cheek and sides; tail, scarcely lighter beneath; feet, and under parts, snowy white. Soles entirely naked.

This species is at once characterized among the smaller American species by having the soles entirely naked from the heel, and covered with a pavement of granular scales. In other respects the feet resemble those of *Hesperomys leucopus* quite closely, except that the middle toes of the hind feet are shorter, the fifth claw reaching to the base of the fourth, instead of falling a little short of it. The posterior tubercle is smaller and rounder than in this species, and its anterior edge is posterior to a point midway between the heels and balls of the toes. The next anterior tubercle (or the outer edge) is smaller, and much less than in *H. leucopus*. The fore feet exhibit the same brevity of the fingers. The feet, generally, are more like *Neotoma* than *Hesperomys*. The ears are very large, longer than broad, not quite as much rounded at the tip as in *H.*

leucopus; they are thin, membranous, and sparsely clothed with scant hairs. The tail is very long, considerably exceeding the body; it is more finely annulated than in *H. leucopus*, and covered with hairs, which, however, do not conceal the annuli.

The hair of this species is quite long, though not particularly soft. The upper parts are of a light grayish yellow, finely lined by the black tips of the hairs; the cheeks and lower part of sides with rather a distinct stripe of light ochrey yellow. The under parts and the feet are pure white; the tail is uniform in color, or, at most, a little lighter beneath, the line of separation entirely inappreciable.

The colors of this species are more yellow, and much lighter, in every way, than in *H. leucopus*. It is much smaller and lighter colored than *H. californicus*, in which we have similar characters of naked soles, very long and unicolor tail, &c.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.							Collected by—		
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.		Length of hind foot.	Height of ear.
1581	2416	♂	Fort Yuma, Cal.	1853.	Maj. G. H. Thomas.	Skin .....	....	....	1.08	3.17	4.08	4.25	....	.76	....	.....
2574			do.....	..do.....	do.....	In alc.....	.48	.95	1.07	2.77	3.70	....	.30	.80	.60	.....
2875			do.....	..do.....	do.....	..do.....	.42	.85	1.00	2.58	3.14	....	.30	.80	.66	.....
1334			Colorado bottom, Cal.	Feb. 24, 1855	Maj. W. H. Emory.	Skin .....	....	....	....	....	....	....	....	....	....	Arthur Schott..
1335			do.....	..do.....do..	do.....	..do.....	....	....	....	....	....	....	....	....	....	....do.....
1336			do.....	..do.....do..	do.....	..do.....	....	....	....	....	....	....	....	....	....	....do.....

HESPEROMYS (ONYCHOMYS) LEUCOGASTER.

Missouri Mouse.

Hypudaus leucogaster, PRINZ MAX. Reise in das innere Nord-Amerika, II, 1841, 99. (Fort Clark.)

Mus Missouriensis, AUD. & BACH. N. Am. Quad, II, 1851, 327; pl. c.

SP. CH.—Color above, grayish brown, passing into yellowish red, and finally into a stripe of fulvous on the sides. Feet, including outer surface of the fore arm and under surface of the body and tail, white. For generic characters see page 458.

This species, in some respects, bears a resemblance to *Arvicola*, especially in the short tail, and rather short ears; it is in general appearance, however, nearer to the ordinary white-footed mice. Still, in many respects, there is a striking difference from both, to be hereafter referred to.

The head is proportioned much as in *Hesperomys leucopus*, though with a broader muzzle; the muzzle is entirely hairy, except on the septum; there is rather more hair than in *H. leucopus*. The lip is cleft nearly to the septum. The eyes are large, the whiskers long, and white and black. The ears are small, about two-thirds the height, and half the area of *H. leucopus*. The antitragus is low and very slightly valvular, less so than in *H. leucopus*. The membrane is rather thick, the surfaces of the ear well coated with short hairs, longest on the convexity, and nearly naked around and anterior to the meatus.

The most conspicuous feature of this mouse is in the peculiar proportions of the limbs. The

anterior of these are larger, the posterior smaller in proportion than usual, the fore feet are very strong, and appear quite fossorial. The fore arm is as long or even longer than the hind foot from the heel, instead, as in *H. leucopus*, of being appreciably shorter. The fore feet are not appreciably different from those of *H. leucopus*, except that they are much larger, the toes longer, and the claws fully twice the length of the hinder ones; the tubercles are similar. The hind feet are short in proportion to the anterior; the first claw does not reach beyond the base of the adjacent toe; there are but four tubercles, as far as I can ascertain, the two posterior in *Hesperomys leucopus* not being represented at all. The sole is very densely hairy from the heel to these tubercles, or for nearly two-thirds the length of the foot; this hairiness more extended and much more dense than in *H. leucopus*, the tubercles themselves appear quite similar in size.

The tail is short, about twice the length of the hind feet, and contained two and a half times in the head and body. It is thick at base, quadrate, and tapers rapidly to an attenuated tip; it is very closely covered with shortish hairs, pressed flat to the surface.

The fur is rather long and full; it is, however, soft and fine like that of *H. leucopus*, or even finer, and without any of the rough appearance of *Arvicola* and *Sigmodon*. The general color of this species above is a grayish brown, finely lined with black; this color predominating on the back. Towards the sides there is an infusion first of reddish and then of yellowish brown, until finally, on the lower part of the sides, is seen quite a distinct band of fulvous. The entire under parts, the feet, and outside of the fore leg, with the lower half of the tail, are white, in the alcoholic specimen, with a yellowish tinge.

In the following table I give the measurements of some parts of this animal, (from a specimen in alcohol, 2549,) compared with a large *H. leucopus*, (2732,) to illustrate the differences in proportion:

	2549.	2732.
Nose to occiput	1. 25	1. 26
root of tail	4. 10	3. 55
Ear	. 46	. 60
Tail, vertebræ	1. 65	3. 05
hairs	1. 70	3. 15
Fore arm	. 82	. 66
Hand	. 55	. 44
Longest finger and claw	. 34	. 25
its claw	. 20	. 06
Femur	. 85	. 80
Tibia	1. 05	1. 05
Hind foot	. 85	. 87
Longest toe and claw	. 30	. 30
its claw alone	. 14	. 07

To show the peculiar proportions of this mouse, I need scarcely do more than to refer to the preceding table.

In external appearance this mouse bears quite a close resemblance to an *Arvicola*, so much so, indeed, as to have been described by Prince Maximilian, several years before Audubon and Bachman, as *Hypudaeus leucogaster*. His specimen was taken at the Mandan village, where it

was said to be abundant in the prairie. That of Audubon and Bachman was found near Fort Union.

List of specimens.

Catalogue number.	Corresponding number of skull.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.							
						From tip of nose to—				Tail to end of verteb.	Length of—		Skull length.
						Eye.	Ear.	Occip.	Tail.		Fore ft.	Hind ft.	
880	1931	Bijoux hills, Neb., near Mo. river...	1855	Dr. F. V. Hayden..	Skin .....	.....	.....	.....	.....	.....	.....	.....	1.10
2549	.....	Vermilion prairie, near Mo. river...	.....	.....	Alcohol ...	.60	1.07	1.25	4.00	1.80	.52	.85	.....

HESPEROMYS (ORYZOMYS) PALUSTRIS.

Rice-field Mouse.

Mus palustris, HARLAN, Sill. Am. Jour. Sc. XXXI, Jan. 1837, 386, (Fast Land, near Salem, N. J.)

ISIS, 1840, 178.

Hesperomys palustris, WAGNER, Suppl. Schreb. III, 1843, 543.

LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 410.

Arvicola oryzivora, AUD. & BACH. N. Am. Quad. III, 1853, 214; plate cxliv, fig. 3.

SP. CH.—Color above mixed black and pale brownish ash, sometimes with a tinge of yellowish brown on the sides beneath ashy white without any distinct separating line. Tail dusky, scarcely lighter beneath. Feet whitish. For generic characters see page 458.

This species is quite different in appearance from the ordinary species of *Hesperomys*, as found in the United States, and indeed would be taken rather for an *Arvicola* or *Sigmodon* than anything else. In size it exceeds any North American species, unless that from Santa Clara, California, be an exception. The ears are unusually short for the genus, in the dried skin, scarcely projecting beyond the skin, although distinctly visible from the side; they are rather higher than broad in life, but nearly orbicular in the skin, the edge completely rounded without any angle. The antitragus is rather lower and less distinct than in *H. leucopus*. The ear has much the appearance of *Arvicola* in respect to its hairs, which are long and coarse instead of being short and velvet-like, as in *H. leucopus*. A peculiarity of this group is seen in the existence of a patch on the concavity of the ear of longer hairs than elsewhere, a short distance from the naked area around the meatus.

The eyes in this species are small, appreciably less than in *H. leucopus*. There is a peculiar appendage to the lower internal corner of the nostril, in the shape of a cartilaginous pad, indented by two furrows which meet below, enclosing an elongated depressed eminence. The axes of these eminences of opposite sides would, if produced, meet on the lower border of the nose; in fact, the pads themselves are very nearly in contact. Something similar is seen in *H. leucopus*, but it is much less conspicuous. The upper lip is cleft or acutely emarginate to the base of the incisor; the furrow, continued thence to the nose, is shallower than in *H. leucopus*, and does not permit as great a separation of the parts, causing the lip to appear less deeply cleft.

The feet present many striking peculiarities, among which is the complete nakedness of the sole from the extremity of the heel. There are six tubercles, the posterior one very long and narrow, as in *Mus*, measuring 0.15 of an inch in one specimen, or more than one-seventh

the whole foot. This is situated near the inner edge of the sole, and so far back that its anterior extremity is scarcely more than half way from the heel to the bases of the toes. There are two tubercles at the bases of the second, third, and fourth toes, and one each at the bases of the first and fifth. The sixth tubercle, a little anterior and exterior to the posterior one, is so small as to be scarcely appreciable. The space posterior to and immediately alongside of the posterior tubercle is perfectly smooth, without granulation; the rest of the sole is covered nearly uniformly with rather coarse small rounded granular tubercles, which extend a short distance along the bases of the toes, which beyond this are transversely furrowed. The normal tubercles (except the posterior) are all so small as to be with some difficulty appreciable in the surrounding granulation. The hind feet themselves are quite long, and set obliquely on the leg, as in the muskrat and some other aquatic rodents; the toes are elongated; the third is longest; the fourth scarcely shorter; the second but little less; the first claw reaches to the base of the second toe; the fifth claw to the penultimate articulation of the fourth toe; the longest toe is considerably more than half the distance from heel to base of the toes; there is a decided though slight web at the bases of the toes.

The fingers of the fore feet are quite long, the tubercles small, as in the hind feet. The thumb is rudimentary, enveloped by a broad nail; the claws are shorter than those of the hind foot.

The tail is nearly or quite as long as the head and body; it is formed much as in the common Norway rat, the hairs, though moderately long, not concealing the annuli.

In general appearance this animal is very similar to a half grown Norway rat, for which, at first sight, it would be taken by most persons. The fur, though rigid and coarse, as in *Sigmodon*, is lustrous and rather compact. Above, it is of a mixed black and pale brownish ash, much darkened along the back by the great preponderance of black tipped or black hairs, grayer on the sides, the colors passing, without any very decided line of separation, into the ashy white of the belly. This white is of no great width, amounting, perhaps, to one-third the entire circumference of the body. The upper part of the tail is dusky brown; the lower half is ash gray; the upper surfaces of the feet are whitish, the hairs very lustrous.

Specimens vary in a greater amount of yellowish brown on the sides, and with a purer white on the belly and feet, and a lighter shade on the under surface of the tail.

As already stated, this species differs very greatly from *Hesperomys* in the much smaller ears, more rigid and coarse hair, and differently constituted feet. These have the hind toes longer, the soles entirely naked, instead of partly hairy, and the posterior tubercle greatly elongated. The tubercles are much smaller, but the granulations between them are much larger. The outer toe is much longer than in *Sigmodon*, reaching to the middle of the second toe instead of extending but little beyond its base. In *Sigmodon hispidus*, too, the plantar tubercles are larger, and the granulation does not extend beyond the bases of the toes.

Compared with young specimens of *Mus decumanus* of the same size of body, the head is much shorter, the ears are much thinner and more membranous; there is a distinct antitragus, (wanting in *M. decumanus*.) The feet are much more delicate, though of much the same length; the sides of the heel are more hairy, and the granulations under the anterior half of the metatarsus are entirely wanting in the Norway rat, its sole being throughout perfectly smooth.

Specimens of this animal from western Georgia are appreciably larger than those from the coast, but I am unable to discern any other difference. A female from Columbus has four pairs of teats.

This species is very remarkable for the combination it presents in the skull of the characteristics of *Hesperomys* and *Sigmodon*, as might have been expected from the external form. The teeth are very similar to *Hesperomys*, except, perhaps, that the salient angles of the upper molars are more opposite, and the lower molars rather broader. The zygomatic arches are parallel in general direction, as in *Hesperomys*, instead of diverging posteriorly, as in *Sigmodon*. There is, however, the short and broad muzzle of *Sigmodon*; the deep emargination of the anterior extremity of the zygomatic arch as viewed from above; the sharp compressed ridge bounding the upper border of the orbit, starting at the narrowest portion of the inter-orbital space, and continued less distinctly to the occiput. The notch at the posterior extremity of the bony palate differs from either, in being more posterior; in fact, behind the posterior molar, by half the length of the molar series, instead of being nearly on a line with the posterior molars. There is a fossa in the bony palate behind, and a little within the posterior upper molar, as in *Sigmodon*, but the two of opposite sides are not separated by an elongated compressed azygos process, as in *Sigmodon*.

Other remarks on the subgeneric affinities of this species will be found under the head of *Hesperomys*, at the head of this article.

This species was first described by Harlan, in 1837, from a specimen said to have been caught near Salem, New Jersey. If this locality be correct, and the animal the same, it will indicate a much wider range along the coast than at present known to naturalists.

The generic name is borrowed from its habits, as given by Audubon and Bachman, of frequenting the rice fields, and doing considerable damage to the crops.

The insertion of the species in the genus *Arvicola*, by Audubon and Bachman, is a mistake, all its affinities being with *Hesperomys*.

List of specimens.

Catalogue number.	Corresponding number of skulls.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.											
						Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Height of ear.	
1305	2107	.....	Society Hill, S. C....	Rev. M. A. Curtis and sons.	Skin .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.20	.....	.....
1310	2111	♂	do	do	do .....	.....	.....	1.33	3.00	3.75	3.83	.....	.....	.....	1.12	.60	.....
2603			do	do	In alc.....	.54	1.12	1.30	4.10	4.04	.....	.45	1.10	.....	.....	.....	.51
2604			do	do	do	.60	1.10	1.35	4.22	4.06	.....	.50	1.15	.....	.....	.....	.51
2605			do	do	do	.52	1.00	1.25	.....	3.70	.....	.43	1.08	.....	.....	.....	.41
2609			St. Simon's Isl., Ga..	Dr. S. W. Wilson	do	.50	.96	1.25	3.70	3.80	3.94	.42	1.11	.....	.....	.....	.51
2610			do	do	do	.60	1.10	1.35	3.80	4.47	.....	.50	1.18	.....	.....	.....	.51
2611		♂	do	do	do .....	.....	.90	1.23	4.00	4.18	.....	.48	1.12	.....	.....	.....	.51
2612		♀	do	do	do	.52	1.00	1.25	3.98	3.90	.....	.44	1.05	.....	.....	.....	.51
2702		♀	do	do	do	.50	.90	1.19	3.60	3.85	.....	.45	1.01	.....	.....	.....	.41
2606		♂	Columbus, Ga	Dr. Gesner.....	do	.61	1.12	1.40	4.55	5.70	.....	.52	1.16	.....	.....	.....	.....
2607		♀	do ..	do	do	.65	1.19	1.60	4.65	3.90	.....	.50	1.14	.....	.....	.....	.51

In the preceding pages I have mentioned, either as distinct species or as synonyms, all the described *Hesperomys* of North America, with the exception of the following :

HESPEROMYS CAMPESTRIS, Leconte.—New Jersey.

Hesperomys campestris, LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 413.

Arvicola (*Hesperomys*) *campestris*, AUD. & BACH. N. Am. Quad. III, 1854, 295.

“Hair plumbeous black, above tipped with brown, beneath with cinereous brown, darker about the mouth ; head large ; ears large, oval, blunt, thinly covered, both within and without, with very short, closely appressed hair ; legs and feet brown ; tail well clothed with tolerably long hair.

“Length, 3.40 inches ; head, 1.20 ; ears, .55 ; width, .40 ; fore leg, .45 ; hind leg, 1.60 ; tail, 2.70.

“This species was found in the collection of the (Philadelphia) Academy, and labelled *Mus campestris*, New Jersey. The specimens were preserved in alcohol, and therefore scarcely fit to be described ; there was, however, enough to show that they were different from any hitherto described animal.”

Of the affinities of this species I will hazard no conjecture, never having seen the specimen described.

NEOTOMA, Say and Ord.

Neotoma, SAY & ORD, J. A. N. Sc. Phila. IV, II, 1825, 346.

AUD. & BACH. N. Am. Quad. I, 1849, 31.

Form closely rat-like. Tail long, more or less densely hairy. Ears very large, nearly naked. Molars rooted, teeth strongly arvicoline, composed partly of straight-sided triangles. Heels hairy.

The genus *Neotoma* is peculiarly North American, and occurs throughout the whole United States, excepting the New England States. It embraces very large species, some of them greatly exceeding the house rats in size, and much superior to them in beauty and docility. One species (*N. magister*) occurs fossil in the caves of Pennsylvania.

The fur of the species is soft and very full in the bushy-tailed species. The ears are very large, as are the eyes, exceeding, in this respect, the house rats.

The molars are all rooted; their grinding surfaces plane, whether tuberculate in the young has not yet been ascertained. They are narrow, those of either jaw of nearly equal width among themselves, (the lower narrower.) Above, they diminish progressively from the first, the last, two-thirds as large as the first. Below, the first two are equal, the last, two-thirds as long.

The upper molars have each two indentations or re-entrant loops of enamel on the outer side; the first or anterior one has two on the inside, the other two but one. The additional inner one of the first molar is very shallow, situated far forward, and, in fact, is a mere indentation in what would otherwise correspond to the anterior triangle of the other teeth, the pattern of all three being otherwise quite similar. Here, as in *Sigmodon*, the re-entrant enamel loops of two sides of a tooth which are nearly opposite each other, come into actual contact, and the hinder outer one extends across to the opposite side, completely separating the dentine into three islands. In the lower jaw there are two re-entrant angles on the outside of the first and second, three on the inside of the first, two of the second, the third has one on either side. The anterior inner indentation of the first molar is much like that on the upper first molar; all the re-entering loops on opposite sides are in the same line and touch each other, the indication of alternation being scarcely discernible.

The loops, both salient and re-entrant, of both jaws, are quite acute, scarcely rounded, the edges or sides, especially the posterior limb of the external upper loops, nearly straight. In fact, a line drawn longitudinally down the crowns of the teeth would divide them into a series of triangles, especially in the lower jaw, where the opposite ones would be placed nearly base to base.

The molars of *Neotoma* have the enamel folds somewhat like those of *Sigmodon*, in the upper jaw, excepting that the angles and lines are more rounded. The lower teeth differ much more; thus the second molar has two indentations on either side, opposite each other in the one, while *Sigmodon* has but one, alternating. The teeth of *Neotoma* are longer, narrower, the sides more parallel, and the salient lobes more divaricated.

There are two very strongly marked sections of *Neotoma*: one with the tail short haired and not more conspicuously hairy than in the common rats, with short snout; the other with a very full densely haired, even bushy, tail, very long muzzle, &c. To the first belong *N. floridana*, *micropus*, *mexicana*, and *fuscipes*; to the other, *N. cinerea* and *occidentalis*. There are very striking differences in the skulls, which, in the bushy-tailed species, have the muzzle greatly

elongated; the orbits much indented, the frontal space between them very narrow, especially behind. In both, the malar bone is very short, the posterior margin of the palate, between the last molars. In both, the nasal branch of the upper maxillary passes back of the end of the nasal, as in *Sigmodon*, instead of terminating in the same line, as in *Mus decumanus*. The upper incisors in both sections are almost as wide as deep, and have the anterior surfaces plane, bevelled off a little at the corners, instead of rounded completely, as in *Sigmodon*. The shape of the lower jaw is much like that of *Sigmodon*.

Species of this genus are found throughout most of North America. One inhabits the south Atlantic and Gulf States, sending stragglers further north; one belongs to eastern Texas and Mexico, and the others belong to the more western regions. As already remarked, a fossil species occurs in Pennsylvania.

The following synopsis may serve to facilitate the determination of the species of *Neotoma*:

A.—TAIL SCANT HAired, (as in the rats.)

a. Feet entirely white; tail not longer than the body alone; lighter beneath.

1. Size of the black rat. Tail about as long as the body alone. Color of the Norway or brown rat. Hind feet, 1.40 to 1.50 inches. Maximum of skull, 2.00 inches *floridana*.
2. About the same size, or rather larger. Tail about three-fourths the head and body. Color, brownish yellow above. Hind feet, 1.15–1.40 inches..... *mexicana*.
3. Rather larger than preceding. Tail little more than half the head and body. Color, uniform grayish slate above. Hind feet, 1.40..... *micropus*.

b. Hind feet dusky; tail nearly as long as head and body.

4. Largest of slender-tailed species. Size and color of the Norway rat. Upper surface of metatarsus dusky; toes alone white. Tail uniform dusky all round. Hind feet, 1.40–1.60..... *fuscipes*.

B.—TAIL DENSELY HAIRY, (as in *Myoxus*.)

5. Fur harsh, rigid; the caudal vertebræ about as long as the trunk. Above, dark rusty brown; beneath, ashy white..... *occidentalis*.
6. Fur soft; caudal vertebræ considerably shorter than the trunk. Above, yellowish plumbeous; beneath, snowy white..... *cinerea*.

NEOTOMA FLORIDANA, Say & Ord.

Wood Rat.

"*Mus floridana*, ORD, Bull. Soc. Philom, 1818."

(SAY & ORD) SAY, in Long's Exped. R. Mts. I, 1823, 54.

DESMAREST, Mammalogie, II, 1822, 307.

Arvicola floridana, HARLAN, F. Am. 1825, 141.

Neotoma floridana, SAY & ORD, J. A. N. Sc. Phila. IV, II, 1825, 352; plate —.—IB. Zool. Journal, II, 1825, 294; pl. x, fig. 1–4. (From preceding.)

ISIS, XX, 1827, 1035.

GRIFFITH'S Cuvier, III, 1827, 160; plate.

Neotoma floridana, AUD. & BACH. N. Am. Quad. I, 1849, 32; pl. iv.

KENNICOTT, U. S. Pat. Rep. 1856, Agricultural, 1857; plate —.

Lemmus floridanus, FISCHER, Syn. 1829, 299.

SP. CH.—Tail with short stiff hairs, not concealing the scaly annuli; about three-fourths the length of the head and body. Ears very large. Feet large.

Color.—Above, mixed lead color, dark brown, and yellowish brown; lighter on the sides. Under parts and feet, white. Tail dusky above, white beneath. Skull elongated and narrow.

General aspect and dimensions of Norway rat, *Mus decumanus*. Head rather acute. Whiskers gray and brown, much longer than the head. Eyes moderate. Ears very large, broad, and thin, with very scanty hairs on both surfaces; naked anteriorly. Antitragus low, narrow. Tail about as long as the body, exclusive of the head, covered with annuli of separate scales, with short stiff hairs springing from under them. These hairs are thick enough to obscure or nearly conceal the scales, which, however, can be discerned through them. The tail is decidedly more hairy than that of the Norway rat. The feet are rather short, the soles naked, although the hairs grow over the sides of the heel almost to the central line. The fur is moderately soft, more so than in the Norway rat, and without the bristly hairs intermixed.

The tubercles of the sole are very large; of these there is one at the bases of the 3d and 4th, and one, each, to the 1st, 2d, and 5th, making four to the five toes, all nearly equal, the outer one with a small supplementary one on its outer slope; there is a fifth, of about the same size, near the inner edge of the sole, and situated about midway between the heel and the base of the toes; a sixth, considerably smaller, is placed about midway between this and the large tubercle at the base of the fifth toe, or a little exterior to the line connecting their centre. Most of the sole is naked; the hairs, however, grow over the inner edge, behind the posterior tubercle, to the middle line of the sole, exterior to which it is naked; the sides of the tarsus, or heel, are overgrown so as to meet in the centre, where the hairs are more sparse; there is, however, a naked space on the extreme heel.

These tubercles are much larger than in the house rat; the posterior one is broad and conical, instead of elongated and narrow; the inner half of the sole, behind the tubercles, with the heel, is hairy, instead of being perfectly smooth, to the very posterior extremity.

The general color of the upper parts is a dull plumbeous, mixed with dark brown and pale yellowish brown, the latter predominating on the sides, especially on the flanks and in advance of the shoulder; the dusky of the sides extends down the outer surface of the limbs to the carpus and tarsus, the feet themselves, with the entire under and inner parts, being white. The line of separation of the two colors is far down the sides, so that when viewed in profile but little of the white of the belly is visible. The upper half of the tail is dusky, the lower white. The ears are like the back. The hairs above are plumbeous for the basal three-fourths, then pass gradually into pale yellowish brown, and then tipped with dark brown. The dorsal region is generally decidedly darker than the sides, where the yellowish brown is of greater extent and the dusky tip very slight. Beneath, the hairs along the ventral region are uniform white to the roots; laterally assuming more and more of a plumbeous tinge.

Specimens vary considerably with age and season. Sometimes the contrast between the back and sides is more striking, with the more decided yellowish brown tinge on the latter; at times there is a greater mixture of yellowish brown on the back, producing a strong similarity to the Norway rat.

In a young specimen, which I refer to this species, collected in Arkansas, by Capt. Whipple,

the color on the back and sides is a nearly uniform grayish plumbeous, a little lighter in tint than the bases of the hairs. There are no other appreciable differences. The same color is seen in specimens from Georgia.¹

Measurements.

	373.		449.		82.	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to occiput	2	4	1	11	2	2
eye.....	1			8½		10½
ear.....	1	9	1	5½	1	9½
root of tail.....	8		5	7½	7	2
Tail, from root to end of vertebræ.....	5	8	3	10	5	
hairs.....	5	11	3	10½	5	1
Ears, height posteriorly.....		9½		7½		9½
anteriorly.....		8½		6½		10
internally, above skull.....		7½		6		
notch		10½		8		10
width.....		7		6		9
Arm, fore foot to end of claws.....		8		7		8½
longest claw.....		1½		1½		
Leg, hind foot from heel to end of claws.....	1	6	1	4	1	5
longest claw		2½		2		2½
Skull, length			1	7½	1	9

This species is very abundant throughout the southern Atlantic and Gulf States, although none were found by Mr. Curtis at Society Hill, South Carolina. A few specimens of unusually large size were captured some years ago by J. G. Bell, near Piermont, on the Hudson river, but I have not heard of any in intermediate localities. It is said to extend a considerable distance up the Missouri river, and the specimen of Capt. Whipple seems to indicate its occurrence far west in Arkansas.

¹ The recent reception of a fine series of *Neotoma*, from Dr. Hammond, at Fort Riley, enables me to give with more precision the characters of the species. The prevailing color of the upper parts is a yellowish brown, on the back darkened by black tipped hairs. The yellowish brown, almost fulvous color, is brightest on the shoulders, as well as on the flanks. The head is ash gray, with a slight wash of fulvous on the crown and on the cheeks. The under parts generally, with the upper surfaces of the feet, are pure white; the hairs on the breast, throat, median line, and lower parts of the belly, white to the roots; on the sides of the middle of the belly, plumbeous to near the tip. Anterior to the fore leg, on the lower part of the sides of the neck, is a large rounded spot of pale yellowish brown, almost saffron; the two of opposite sides separated only by about an inch or less. This is a purer tint of the same color as seen on the flanks. The tail is quite hairy and depressed; the lower half white, in strong contrast with the dusky plumbeous of the upper portion.

These specimens agree exactly with Mr. Bell's specimen from near New York, and are much larger and brighter colored than any I have seen from the south.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.							
						Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Length of fore foot.	Length of hind foot.	Length of skull.
373	.....	....	Rockland Co., N. Y.	John G. Bell	Mounted .....	.....	.....	.....	8.02	5.55	.....	1.54	.....
82	2 144	....	Charleston, S. C.	J. J. Audubon	Skin .....	.....	.....	.....	6.85	4.85	.....	1.46	1.55
282	2 978	....	Georgia	do.	do. ....	.....	.....	.....	6.38	4.05	.....	1.32	1.70
.....	2056	....	St. Simon's island, Ga.	J. P. Postell	Skull .....	.....	.....	.....	.....	.....	.....	2.00	1.05
.....	2201	....	do.	do.	do. ....	.....	.....	.....	.....	.....	.....	1.90	.....
1026	2464	....	do.	Dr. S. W. Wilson	Skin .....	.....	.....	.....	7.25	6.30	.....	1.40	2.00
1627	2463	....	do.	do.	do. ....	.....	.....	.....	6.75	4.30	.....	1.34	.....
1628	.....	....	do.	do.	do. ....	.....	.....	.....	5.95	3.32	.....	1.20	.....
2696	.....	....	do.	do.	In alcohol	.83	1.65	2.00	.....	5.25	.73	1.42	.....
2697	.....	....	do.	do.	do. ....	.....	.....	.....	5.75	.76	1.48	.....	.....
.....	2465	....	do.	do.	Skull .....	.....	.....	.....	.....	.....	.....	1.72	.85
2677	.....	....	Indian river, Fla.	G. Wurdemann	In alcohol .....	.....	.....	.....	6.40	.70	1.38	.....	.....
2678	1682	....	Washington, Miss.	Col. Wailes	do. ....	.....	.....	.....	.....	.75	1.39	.....	.....
2 449	1583	....	Antelope Hills, Ark.	Capt. Whipple, U. S. A. ¹	Mounted .....	.....	.....	.....	5.75	4.12	.....	1.35	1.65
2951	.....	♀	Fort Riley, K. T.	Dr. W. A. Hammond	Skin .....	.....	.....	.....	9.00	5.00	.....	.....	.....

¹ Collected by H. B. Möllhausen; color, plumbeous.

NEOTOMA MEXICANA, Baird.

Bush Rat.

Neotoma mexicana, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 333.*Neotoma floridana*, GEOFFROY, Voyage de la Venus, Zoologie, 1855, 154; pl. xiii.

Sp. CH.—Ears very large. Feet small. Tail three-fourths (?) as long as the head and body, covered with stiff hairs, so as to conceal the annuli. Fur long and very soft.

Color.—Above, light yellowish brown, lined with dark brown; on the sides clearer fulvous. Feet and under parts white.

Of two specimens of this species the largest is about the average of *N. floridana*, or less. The whiskers are longer than the head, mixed gray and black. The ears are very large, larger than in either *N. floridana* or *micropus*; they are thin and coated scantily with short hairs, so as to appear nearly naked. The tail in the larger specimen is broken off; in the smaller it is longer than in *N. micropus* and more thickly haired, longer even than in *N. floridana*. The feet are small, as in *N. micropus*; the third and fourth fingers longest; the claw of the second reaching to the end of the third finger; the fifth claw beyond the base of the fourth; the second and fifth being thus but little shorter than the third and fourth. The palms are naked. The first toe is very short, scarcely extending beyond the base of the second; the second, third, and fourth are equal and longest; the fifth claw reaches to the base of the fourth; the soles are hairy towards the heel; naked towards and under the toes.

Color.—The upper parts generally are of a pale yellowish brown, or even brownish yellow, much lined on the back with dark brown; the former, however, very decided on the sides, which are still more distinctly colored along the line of junction of the white of the lower parts. The outside of the legs are like the rest of the sides; the feet and whole under parts white, with a

yellowish tinge. The hairs above and on the sides, as well as those on the middle of the belly, are plumbeous at base. The tail is dusky above, whitish beneath.

The skull of this species offers striking points of distinction, from both *N. floridana* and *micropus*, though most closely resembling the latter. The upper outline of the skull is slightly convex, less so than in these other species. The nose is longer than *N. micropus*, the incisive foramina larger; the zygomata further separated than in *N. floridana*, but more nearly parallel than in *N. micropus*. The upper surface of the head is strongly concave, longitudinally, the temporal crests well marked. The nasal bones and the slender nasal postero-superior process of the intermaxillary end on the same line posteriorly, and do not extend as far backwards as the anterior extremity of the orbits, while in the others the intermaxillary processes extend considerably backwards of this; the nasal bones, too, are broader at their middle point than in the others. The rami of the lower jaw are higher than in any other species examined; the neck of the condyloid process elongated, its axis forming an angle of fully forty-five degrees with the base; the highest point of the condyle is even higher than the coronoid process, instead of being considerably below its level. The lower part of the post-coronoid notch is acute, the coronoid process smaller than usual; the notch behind the condyloid process is very long. When the lower jaw is placed on a horizontal surface, a perpendicular at the posterior extremity will be tangent to this and the posterior extremity of the condyle, instead of falling considerably in advance of it as in other species. The body of the bone in advance of the molars is less deep than usual. The lower molars are narrow and quite parallel, the lobes narrower, and their sides more parallel.

I do not feel sure, however, that all these peculiarities of the skull will be found characteristic of the species, as individual specimens sometimes vary considerably.

General dimensions.	289.		565?	
	Inches.	Lines.	Inches.	Lines.
Nose to occiput				9½
ear			1	8
root of tail	7	3	8	
Tail, from root to end of vertebræ	Lost.	Lost.	5	
hairs			5	3
Ears, height posteriorly		9		
anteriorly		8		
internally above notch		10½		
Arm, fore foot to end of claws		7		7
longest claw		¾		
Leg, hind foot, from heel to end of claws	1	2	1	2
longest claw				
toe and claw		3½		4

The specimen collected by Dr. Webb was captured in October, 1852, at Chevate, near Ojo Caliente, on the road between El Paso and Chihuahua, about one hundred miles from the latter place. Their curious structures were seen in various directions between the rocks, and consisted

of arched galleries of sticks and twigs, filled up with mule dung and moss, and from four to eight feet long, terminating usually in a bed of moss or hair under a rock.

This species is readily distinguished from *N. floridana* by its much smaller feet and rather more hairy tail, as well as by the much lighter color above and on the sides. The fur is longer, fuller and softer than in either *N. floridana* or *N. micropus*. There is no indication of the slate gray of *N. micropus*, and it has a more densely furred tail, which also appears longer. The feet, also, are even smaller than in *N. micropus*. Skull broader than in *N. floridana*.

Since preparing the preceding article, a large number of specimens has been received, which tend to establish the species more fully. Among them are several from the Colorado river, collected by Mr. Schott, and three from the Pecos, collected by Capt. Pope. These are generally similar, except that one (No. 1730) is of a light grayish slate color, lined with darker. This is lighter than as described in *N. micropus*. I have not been able to examine the skulls, to see if they agree with the characteristics derived from the first specimens.

A very good figure of this animal has been published in the Atlas of the Voyage of the Venus, taken from a specimen collected in Lower California by M. Neboux. This extends its distribution from the Pecos river to the Gulf of California, and gives to it, compared with *N. micropus*, somewhat the same range as *Spermophilus spilosoma*, compared with *S. mexicanus*.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—
								Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore feet.	Length of hind feet.	Length of skull.	Width of skull.	Height of ear.	
229	1674	.....	Chihuahua City....	.....	John Potts.....	.....	Skin....	7.50	.....	.....	.60	1.18	.....	.85	.84	.....
565	.....	.....	Chevate springs, Sonora	.....	Dr. T. H. Webb.....	.....	..do....	5.00	.....	.....	.53	1.17	.....	.....	.....	.....
1033	2201	.....	San Pedro river, Sonora.	.....	Major W. H. Emory...	.....	Mounted.	.....	.....	.....	.....	.....	.....	.....	.....	Dr. Kennerly
1328	.....	♂	Colorado bottom, Cal..	Mar. 31, 1855	do.....	8	Skin....	10.50	6.60	6.85	.....	1.33	.....	1.00	.....	A. Schott....
1329	2160	♀	do.....	April 4, 1855	do.....	8	..do....	9.00	6.60	.....	.....	1.30	1.80	.98	.95	do.....
1339 to 1343 ¹	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1606	.....	.....	San Diego, California..	.....	Dr. J. F. Hammond ..	.....	Skin....	7.00	5.00	.....	.58	1.18	.....	.....	1.05	.....
1731	.....	♂	Pecos, New Mexico....	June 14, 1856	Capt. J. Pope.....	.....	..do....	8.00	.....	.....	.....	1.33	.....	.....	.....	.....
1732	.....	♂	.....	May 12, 1856	do.....	.....	..do....	10.50	4.90	.....	.....	1.40	.....	.....	.....	.....
1730	.....	♂	.....	June 5, 1856	do.....	.....	..do....	8.40	.....	.....	.....	1.33	.....	.....	.70	.....

¹ Five young ones, belonging to 1329.

NEOTOMA MICROPUS, Baird.

Black Wood Rat.

Neotoma micropus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 333.

SP. CH.—Above grayish slate, beneath with feet white. Feet small. Tail hardly two-thirds the length of body; scantily haired. Feet entirely white.

This species is about the size of the Florida rat, *Neotoma floridana*, or a little larger, and belongs to the same section of slender tailed species. The head is broad and pointed, the whiskers longer than the head, mixed black and gray. The ears are very large, broad and

thin; the antitragus low; the two surfaces with scattered rather short hairs, except inside near the meatus, where it is naked. The fur is moderately soft, about like that of *N. floridana*. The tail is quite short, not as long as the body, exclusive of the head; it is clothed with short stiff appressed hairs, which obscure without concealing the scaly annuli; they are rather more sparse than in *N. floridana*. The feet are small; the first finger very rudimentary, with a closely applied nail; the third and fourth about equal and longest; the second but little shorter; the fifth claw not reaching to the base of the fourth. The claws are all short, high, and much curved; the palms are naked. On the hind foot the central three toes are longest; first claw falling a little short of the base of the second; the fifth reaching to about the base of the fourth; all the claws are stout and much curved, larger than those on the fore feet. The soles are naked, with only a few scattered short hairs, more numerous apparently than in *N. floridana*, especially towards the heel.

The upper parts are of a grayish lead color, finely lined with dark brown; the sides of the body and limbs similar, but paler. There is an occasional tinge of faint yellowish brown, especially along the shoulders and flanks. Beneath, with the feet, white. Above, the hairs are dark plumbeous at base, assuming a still darker tinge towards the tip, which is either bluish gray, as described, or dark brown, nearly black. On the sides the tips become lighter. Beneath, the hairs are plumbeous at base on the middle of the belly, anteriorly they are uniform white. The tail is dusky above, grayish white beneath.

Measurements.

	554.		561.	
	Inches.	Lines.	Inches.	Lines.
Nose to occiput			1	8 $\frac{1}{3}$
to eye				10 $\frac{1}{2}$
to ear			1	5 $\frac{1}{2}$
to root of tail	8	4	7	1
to end of outstretched hind legs	9	11		
Tail from root to end of vertebræ	4	10	4	1
from root to end of hairs	5		4	2
Ears, height posteriorly		11		
height anteriorly		10		
internally above notch		10 $\frac{1}{3}$		
width		9 $\frac{1}{2}$		
Arm, fore foot to end of claws		7 $\frac{1}{3}$		7 $\frac{1}{3}$
longest claw		1 $\frac{1}{2}$		1 $\frac{1}{2}$
Leg, hind foot from heel to end of claws	1	4 $\frac{1}{2}$	1	4
longest claw		2		2

Skins much distorted.

As already stated, this species bears a close resemblance to *N. floridana*, from which, however, it exhibits considerable differences both in the skin and skull. Comparing specimens of as nearly similar character as possible, the present species is found to have a shorter tail, rather less hairy; rather larger ears, and decidedly smaller feet and hands. In *N. floridana*, the third and fourth fingers are longest, and project considerably beyond the second and fifth, the claws of which

scarcely reach to the bases of the claws of the digits next them; in *N. micropus*, the claw of the second finger reaches nearly to the middle of the third. The toes are similarly circumstanced. In *N. floridana*, the first claw reaches to the penultimate articulation of the second toe; the fifth claw to the base of the fourth. In *N. micropus*, the outer toes are longer and the inner shorter than in the other species. The color of *N. micropus*, even in adult specimens, is much darker and more plumbeous, with less mixture of yellowish brown on the sides. The white on the feet and legs is more restricted.

Compared with *N. floridana*, the skull of this species is much broader between the zygomata, in this respect approaching to *N. occidentalis*; the divergence, too, of these bones behind is greater. The nose is longer. The concave depression in the top of the head between the orbits is deeper; the posterior wall of the orbit more vertical, and nearer to a perpendicular with the axis of the head. The orbital opening is wider. There is a firmly attached rudimentary lachrymal bone which I have not obtained in other species. The outline of the head above is gently convex, as in other thin-tailed species. The temporal ridges are more distinct than in *N. floridana*. The molars are broader and the angles more rounded; in fact, larger every way. The outlines of the lower jaw, too, are different. The neck of the condyloid process is longer; its axis more horizontal; the articulating surface is larger and more below the level of the coronoid process; the bottom of the notch between the two more horizontal; the notch below the condyloid deeper; the entire ramus lower, and the body of the bone anterior to the molars deeper. The incisors, upper and lower, are wider and larger.

The dark colors of this species, although resembling somewhat those of the immature Florida rat, and of many young rodents generally, appear to be permanent, as the specimens examined appear perfectly adult, even larger than the Florida rat. The shade, too, is quite different from the immature tints above mentioned, in being more lustrous, and more like the colors of the black rat. An additional confirmation of the idea that the species does not become lighter, is found in the MS. description by Doctor Berlandier, who was very familiar with it, and who mentions it as "grayish ash on the sides, darker on the back; throat, breast, belly, feet, and hands whitish."

A very striking difference between the skulls of *N. micropus* and *floridana* is seen in the shape of the posterior outline of the bony palate. This, in the former, has the outline of the notched part narrow, wedge-shaped, truncate anteriorly, and scarcely reaching beyond the middle of the posterior molar. Between the last molar and the side of the notch is a width of bone of the diameter of the molar itself, the greatest width of the notch not being more than twice this strip of bone. In *N. floridana*, the notch extends as far as the middle molar, and involves nearly the entire space between the posterior molars on either side. *N. mexicana* differs from *floridana* in the same character, except that the notch extends further forward than in *N. micropus*. In fact, all the slender-tailed species from the west agree in the narrow notch, as described.

The skull of *N. fuscipes* exhibits, in a marked degree, the peculiarity of the western *Neotomas*, in reference to the notch of the palate. This is very narrow; the sides parallel, the anterior end transverse, the notch being thus exactly rectangular, and only about .08 of an inch wide at any part; about the width of the molars, or one-fifth the distance between the outer edges of the two rows of the latter.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence obtained.	Original number.	Nature of specimen.	Measurements.				
								From tip of nose to tail.	Tail to end of verteb.	Length of hind foot.	Width of skull.	Height of ear.
554	1676	♂	Charco Esccondido, Mexico....	March, 1853	Lieut. D. N. Couch, U. S. A..	86	Skin	9.00	4.25	1.40	1.05	.90
561	.....	.....	Santa Rosalia, Mexico.....	do.....	do.....	38	...do	6.50	.....	1.40	.....	.70

NEOTOMA FUSCIPES, Cooper, Mss.

SP. CH.—Larger than the house rat (*Mus decumanus*.) Tail nearly as long as the head and body, compressed at tip. Color above, yellowish rusty brown, lined with black. Beneath, soiled white. Hands and toes of hind feet white; the upper part of metatarsus dusky. Tail uniformly dusky all round.

(2679. ♂) This animal is about the size of the largest Norway rats, to which, in many respects, it bears a not distant resemblance. In the alcoholic specimen, however, the head appears narrower. The ears are very large and wide, rather longer than broad; their longest diameter in the line of the axis of the head; both surfaces coated with short hairs, except around the meatus. The nose is covered with hair to the end; the septum is naked, with a groove which extends to the incisors, and is naked at its bottom. The upper lip is deeply cleft to the base of the incisors, the cleft continued to the furrow of the nose, as described. The whiskers are very long, extending far behind the occiput, and at least as far as the axillae. The eyes are small, situated about midway between the nose and the meatus; its distance from the base of the ear is about the length of the ear itself.

The feet are rather small, and the fingers and toes appear short and thickened. The thumb is a thickened tubercle, armed with a small flat nail, which does not reach to the end of the tubercle, and bears a striking resemblance to that of the human hand. The third finger is longest; the fourth but very little shorter; the second is a little shorter; the fifth claw reaches to the base of the adjacent fourth claw. The palms are naked, with five very large and angular tubercles almost covering the surface: one at the bases of the second and fifth fingers, respectively, one at the conjoint base of the third and fourth, and two large ones on the posterior part of the palm. The hind feet are short, (the fore ones about two-thirds their size.) The toes are short, occupying about one-third the whole length of the hind foot; their proportions are much as in the fore feet, the first one, however, less rudimentary, of course, its claw reaching to the penultimate articulation of the second toe. The soles are naked under the entire metatarsus; the tarsal portion is hairy, although a strip of naked skin penetrates it a short distance from near the outer edge of the metatarsal portion of the sole, and, in fact, appear, almost to be continued to the heel on account of the shortness of the hair. There are six very large tubercles on the sole; one under the posterior third of the foot, the other five arranged almost precisely as in the fore foot. The tail is thick, cylindrical, and tapering to a rather obtuse tip; it is longer than the body, without the head; nearly equal to the entire length of head and body; it is covered with short hairs, usually more or less concealing the annuli, which are much shorter than in the Norway rat. In the dried specimens the tail becomes much compressed towards the end, like that of the muskrat.

The general color of this animal above is a mixed black and light reddish brown, the latter color predominating on the sides, so much in some specimens as almost to constitute a stripe; on the dorsal region it is much obscured by black tips to the hairs. The under parts are of a soiled yellowish white, the line of demarcation passing low on the cheeks and belly, where the white does not occupy scarcely more than one-third of the entire circumference. The exterior of the limbs, including anterior and posterior edges, is like the back, the color coming down to the very wrist of the hand, and not only reaching to the ankle joint of the hind foot, but extending over the metatarsus to the bases of the toes. This character is constant in all the California specimens I have seen. The tail is uniformly dusky all round; not lighter below.

The fur is rather long, coarse, and somewhat stiff. I have not been able to detect any under fur, even in winter specimens.

The five specimens from Santa Clara and Petaluma all present a striking constancy in the great length of tail and its dusky color, the dusky hind feet, and other characteristics. In many respects—size, color, dusky feet, &c.—there is a very close resemblance to the *Neotoma occidentalis*, from which the nearly naked tail will at once distinguish them.

The considerably longer tail, dusky feet and tail, and larger size, will readily distinguish this species from all the others described as North American.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of speci- men.	Measurements.									
							Tip of nose to—				Tail to end of verteb.	Length of—		Skull—		Height of ear.
							Eye.	Ear.	Occip.	Tail.		Fore ft.	Hind ft.	Length.	Width.	
2679	.....	♂	Petaluma, Cal.	Feb., 1856...	E. Samuels	In alcohol	1.07	2.00	2.40	8.20	7.90	.85	1.58	.....	.....	.....
2680	.....	.....	.....do	do	do	do	.86	1.56	1.93	6.25	6.15	.76	1.22	.....	.....	.....
1158	2040	♂	Santa Clara, Cal.	Nov., 1855...	Dr. J. G. Cooper ...	Skin .....	.....	.....	2.25	9.00	8.50	.75	1.55	2.15	1.15	.....
1159	2041	♂	do	do	do	do .....	.....	.....	.....	.....	6.50	.80	1.60	.....	.....	.....
1182	.....	.....	.....do	do	do	do .....	.....	.....	.....	9.50	7.00	.....	1.42	.....	.....	.90

NEOTOMA OCCIDENTALIS, Cooper.

Hairy-tailed Rat.

Neotoma occidentalis, (COOPER, MSS.) BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.

Neotoma drummondii, AUD. & BACH. N. Am. Quad. I, 1849, 223; pl. xxix.

SP. CH.—Size that of the Norway rat. Fur rather harsh, not compact. Tail densely hairy; the vertebræ as long or longer than the body, exclusive of the head; above, broadly grayish lead color, the basal wool but little lighter. Posterior third of soles furred. Body above, brownish plumbeous, with a slight mixture of yellowish brown. Under parts of body and tail, with feet, bluish white.

In size this animal equals or exceeds the Norway rat, *Mus decumanus*, to which, however, with its large ears and bushy tail, it has little resemblance. The whiskers are stiff, and longer than the head; the head elongated and acute. The eyes rather large. The ears large, broad, and thin, scantily clothed with pretty long hairs. The feet are moderately large; the thumb, as usual, a rudimentary tubercle or knob, with a broad nail; the fourth finger longest; the third,

however, not appreciably shorter, the second claw reaching to the middle of the third; the fifth a little beyond the base of the fourth; palms naked, with large tubercles or pads. The first toe short, its claw reaching to about the middle of the second, exclusive of its claw; the third longest; the second and fourth equal and but little shorter; the fifth claw reaching a little beyond the base of the fourth. The sole is densely hairy from the heel to the first pad, or for about one-third the length of the under part of the foot; from this point it is naked, with very large pads. All the claws are concealed by long hairs springing from their bases. The fur is rather harsh, not conspicuously softer than that of *M. decumanus* would be with longer hairs. The tail is longer than the body, exclusive of the head; thick, and densely clothed throughout with long hairs, more than an inch long, with a coarse crumpled fur between their bases; it is cylindrical at the base, but towards the end is depressed and widens a little.

The prevailing color of the upper parts is a very dark brown, nearly black, with a slight lining of yellowish brown, much overlaid by the former color; with this there is a mixture of plumbeous, caused by the exposed bases of the hairs; on the sides there is a tint of yellowish brown mixed with the black hairs, but becoming purer and clearer towards the belly. The outside of the limbs to the carpus and tarsus is much like the back; the upper surface of the feet and under parts generally are dirty bluish white, mostly plumbeous at base. Interspersed everywhere over the back and upper part of the sides are black hairs, longer than the rest of the fur. The tail is white beneath. Above, it is like the back towards the base, but towards the tip it becomes of a more uniform brownish plumbeous. Viewed from above, the white of the lower surface is not distinctly visible. The hairs above at their bases, with the coarse wool intermixed, are grayish plumbeous.

In a series of specimens collected both in winter and in summer there is no appreciable difference in color, nor is there any closer resemblance to the true *N. drummondii* (*N. cinerea*) than is described above. There is, however, an appreciable variation in the size of the ear. The tail, appears to be less bushy in summer, and the soles less densely hairy.

Measurements.

	572. ♂		462. ♂		463. ♀	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Nose to occiput.....	2	5				
eye.....	1	2				
ear.....	2	3				
root of tail.....	10		10		8	
Tail, from root to end of vertebræ.....	8	5	8		6	5
hairs.....	9	8	9	3	7	6
Ears, height posteriorly.....				11		
internally above notch.....	1		1			
Arm, fore foot to end of claws.....	1			10½		
longest claw.....		2		1¾		
Leg, hind foot from heel to end of claws.....	1	8	1	9½	1	7
longest claw.....		2¾		2½		

The specimens agree in all essential characters of color and proportions—No. 87 only having a greater admixture of yellowish rusty on the sides, and a still longer tail.

The skull of this species differs from all those with slender tails in the greater elongation of the nasal bones, and consequently longer snout. The outline of the skull above, from the parietals to the middle of the nasals, is perfectly plane, or even slightly concave; the interval between the orbits very narrow and the outlines concave. The bone between the parietals and occipital is narrower anteriorly than in other species and advances further forward between the parietals.

This species was described by Audubon and Bachman as *N. drummondii*, but the possession of a specimen of very different character, collected east of the Rocky mountains by Dr. Suckley, and which seems to be a fair representative of the last mentioned species, enables me to separate the two. The fur of *N. occidentalis* is much coarser and crisper, without the soft, compact feeling of *N. cinerea*. The ears are perhaps smaller. The tail is longer, with more plumbeous above and less white laterally. The back is much darker, though mixed with yellowish brown. For other differences, I would refer to the article on *N. drummondii*. It is probable that the present species is confined to the country west of the mountains, or even near the Pacific coast; *N. cinerea* occurring in the main chain, or east of it.

The bone caves of Pennsylvania have furnished me with several lower jaws of a fossil *Neotoma*, considerably larger than that of the largest specimen even of any recent species which I have seen. The body could not have been less than twelve inches in length; it differs from the others in the wider and more massive molars, the lobes of which are all more nearly equal than in the rest, and all rounded, not angular. The inner and outer sides of the molars are very nearly symmetrical, and the indentations or folds of nearly equal depth. The axis of the condyloid process is quite oblique, and the condyle below the level of the coronoid. The species may be called *N. magister*.

List of specimens.¹

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.							Collected by—
								Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Hind foot, length.	Skull, length.	Skull, width.	
2397	.....	♂	New Dungeness,	Jan. 1857	Dr. Geo. Suckley.	149	Skin.....	2.38	9.75	7.50	8.38	1.70	.....	.....	.....
462	1662	♂	Sta. of de Fuca.	June, 1854	Dr. J. G. Cooper	16	do .....	.....	10.00	.....	8.50	1.75	.....	1.10	.....
			Shoalwater Bay,												
			W. T.												
463	.....	♀	.....do.....	Sept. 1854	do.....	16	do .....	.....	9.00	.....	7.00	1.65	.....	.....	.....
572	.....	♂	.....do.....	.....	.....do.....	.....	do .....	.....	10.00	.....	8.50	1.85	.....	.....	.....
89	.....	.....	Columbia river...	.....	Phila. Acad.	.....	Mounted.	.....	10.00	.....	8.50	1.75	.....	.....	J. K. Town-
					Nat. Sc.										send.
968	2019	.....	Astoria, O. T....	June 30, 1855	Lt. W. P. Trow-	.....	Skin.....	.....	8.17	.....	6.67	1.75	1.85	.....	Jas. Wayne.
					bridge.										

¹ All the measurements except those of the feet taken before skinning.

NEOTOMA CINEREA.

Rocky Mountain Rat.

Mus cinereus, ORD, Guthrie's Geography, 2d Am. ed., II, 1815, 292.—(Based on the ash-colored rat of Rocky Mts. of Lewis & Clark.)

Myoxus drummondii, RICH., Zool. Jour. III, Apr. 1828, 517.—(R. Mts.)

WAGNER, Schreber Säugt. IV, tab. 227. A.

Neotoma drummondii, RICHARDSON, F. B. A. I, 1829, 137; pl. viii.—(Not of Aud. & Bach.)

PRINCE MAX. Reise. I, 1839, 365.

WAGNER, Suppl. Schreb. III, 1843, 560.

Rat with hairy tail, LEWIS & CLARK, I, 1814, 289; II, 178.

SP. CH.—Size of Norway rat. Fur very soft and smooth. Tail densely hairy, the vertebrae shorter than the body without the head; above narrowly lead gray, with the short basal wool light gray. Posterior third of soles furred. Above light yellowish brown, with some darker hairs intermixed, deeper on the sides. Under surface of body and tail, with feet, snowy white.

A single specimen of this species was obtained by Dr. Suckley, on Milk river, Nebraska, on the 20th of August, 1853, where it was known as the prairie rat. It is not in sufficiently good order to supply a satisfactory description, but seems to agree perfectly with the account of Richardson, and differs in essential points from those specimens of *Neotoma* collected on the Pacific coast by Dr. Cooper. The fur is long, full, and very decidedly softer than that of *N. occidentalis*; the hairs are nearly of equal length, a few rather longer ones interspersed. The ears are very large and broad, scantily coated with short grayish hairs on both sides. The tail is shorter than the body, densely clothed with long hairs, with coarse wool interspersed. The posterior third of the soles is wooly.

The prevailing tint of the upper parts is a clear, pale yellowish brown or light buff, clouded by the dusky tips of the longer interspersed hairs. Most of the hairs, however, are without dusky tips at all, being lead gray to near the yellowish tips. The outside of the legs is like the back, but the feet, with the whole lower parts, are white. The tail above is grayish lead color, the longer hairs being dark ash, the short wool intermixed, clear gray. Beneath, the tail is white, and this color is distinctly visible, viewed from above. The hair on the belly is pure white to the roots.

Measurements.

	224.	
	Inches.	Lines.
Nose to eye.....	1	2½
Nose to root of tail.....	7	9
Tail, from root to end of vertebrae.....	5	-----
Tail, from root to end of hairs.....	5	10
Ears, height posteriorly.....	-----	11
Ears, height internally above notch.....	1	-----
Arm, fore foot to end of claws.....	-----	9
Leg, hind foot from heel to end of claws.....	1	5

In this specimen of Dr. Suckley's I, without difficulty, recognized the original *Myoxus drummondii* of Dr. Richardson, so different from the animal given by Audubon and Bachman. It is hardly possible that the distinctions between this skin and those collected by Mr. Townsend on the Columbia, and which served as the basis of the descriptions of Audubon and Bachman, can be less than specific. Four specimens of this *N. occidentalis*, one of Mr. Townsend's original specimen and three sent by Dr. Cooper, agree in all points, and were collected, respectively, in the months of June, September, and October; Dr. Suckley's in August, a period covered by that of the others. The fur of the present species is very much softer, both above and below; the tail shorter, with more white on the sides, less brown above, and the coarse wool at the base lighter gray. The ears are larger. The color above is a very light yellowish brown or fawn, instead of a brownish lead color mixed with a little yellowish brown. A comparison of the portion of the skulls remaining in the skin exhibits important differences. The molars are decidedly broader, though of the same aggregate length; the hinder one shorter and more condensed. The shape of the lower jaw is decidedly different; it is much shorter and more massive, thicker below the molars, the symphysis longer and stouter, the body deeper, and in every way calculated for greater strength.

A skin received from Dr. Hayden, since the above description was prepared, and collected on the Yellowstone, agrees in all essential characters.

This species was first mentioned and very accurately described by Lewis and Clark, from a specimen taken near the falls of the Missouri, who, however, imposed no scientific name. This was done in 1815, by Ord, in his little known list of the animals of North America, in the second American edition of Guthrie's Geography. In 1828, it was called *Myoxus drummondii*, by Richardson, from its close resemblance to that genus. Subsequently, however, an examination of the teeth showed him that it belonged to *Neotoma*. The species described by Audubon and Bachman as *N. drummondii* belongs to quite a different species, (*N. occidentalis*.)

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.						Collected by—
						Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of hind foot.	Length of skull.	Ear above notch.	
224	1694	Milk river, Nebraska.....	Aug. 26, 1853	Gov. I. I. Stevens..	Skin...	7.75	5.00	5.83	1.42	.....	1.00	Dr. Suckley, U. S. A.
1331	2159	Fort Sarpy, Yellowstone river.	Aug. 1854	Col. A. Vaughan...	..do....	7.00	4.00	4.50	1.42	1.75	.90	Dr. F. V. Hayden...

SIGMODON, Say & Ord.

Sigmodon, SAY & ORD, J. A. N. Sc. Phila. IV, II, 1825, 352.

WAGNER, Suppl. Schreb, III, 1843, 555.

AUD. & BACH. N. Am. Quad. I, 1849, 227.

SP. CH.—General appearance, arvicoline. Ears and tail moderate. Molars rooted, surface plane; the two last in the lower jaw with the enamel forming a sigma, or an S.

In external appearance, the species of *Sigmodon* closely resemble the larger arvicolas, in the stout body, the long hair more or less concealing the ears, and the tail shorter than the trunk. The under hair is tolerably soft, but there is so great a development of longer hairs as to produce quite a hispid appearance, whence the name of one species.

The muzzle is very blunt, as in *Arvicola*, the ears are large, but much buried in the fur; the muzzle hairy, except on the septum. The upper lip is emarginate, but not very deeply cleft. The antitragus is large and valvular. The thumb is rudimentary, covered by a broad, flat, nail. In the hind foot the lateral toes (1st and 5th) are very short, and nearly equal, their claws reaching barely to the bases of the adjacent toes, instead of projecting considerably beyond them, as in *Neotoma*, *Hesperomys*, *Mus*, &c. The soles are perfectly naked from the very heel, and exhibit six black tubercles much smaller than in *Neotoma* or *Hesperomys*; the skin around these tubercles is granular, very different from *Mus*. The claws are longer than in *Mus* or *Neotoma*.

The incisors are rather stout and a little compressed; the upper ones are much rounded on the anterior face which has, besides, one or two faint ridges. Owing to the convexity transversely of these incisors, a considerable portion of the anterior face is visible from the side. The lower incisors are about as wide as the upper, and bevelled off on the outer edge so as to be triangular in cross section.

The anterior upper molar is the largest, the second and third diminishing successively. The second is as broad as long, as wide or wider than the first; the third nearly as long, but narrower. The enamel folds have the same general characters as described for the sigmodonts, (viz: their convexity posteriorly above and anteriorly below, deeper indentation on the outside above, &c.) All the upper molars have two indentations or re-entrant loops of enamel on the outer side; on the inside, the first has two, the remainder have each one. There are nowhere on the folds any acute angles with straight sides, but all are regular rounded loops. The first and second inner loops of the first molar are a little anterior, respectively, to the first and second on the outside; on the second and third the anterior outer loop is a little anterior to the single inner one, but so near that they appear in one nearly continuous slightly oblique transverse line. The loops are greatly indented, so much so that those of opposite sides meet, and the posterior outer single ones extend across to the opposite side, thus dividing the dentine into three or more nearly complete islands.

In the lower jaw, the first molar is the longest, widest behind and tapering forwards; the two others are about as broad as long, similarly shaped, the second rather largest; in fact, somewhat wider than the first. The first molar has three indentations or re-entrant loops of enamel on the outside, and two inside, the others have one only on each side; here the inner loop is anterior instead of the outer, as in the upper jaw; those of opposite sides considerably separated. The folds are indented as much as in the upper jaw. The second lower molar, in

one specimen, (1667,) has a small accessory peninsula of enamel on the inside, which almost indicates a second loop; it is, however, slight, and must disappear at quite an early age.

The skull, in some respects, has a not inconsiderable resemblance to that of *Mus decumanus*, especially in the well defined, compressed, elevated ridge which margins the upper border of the orbit, and extends backwards along the temples, until it bends off downwards nearly at a right angle. The head is, however, much broader across the zygomata, and shorter, the muzzle wider. The nasal process of the maxillary extends back behind the nasal and lachrymal bones; the thin plate at the anterior end of the zygomatic arch is broader, thinner, extends further forward in a more nearly vertical plane, and is produced above into a point, with a broadly rounded emargination below it. The zygomatic process of the temporal stands out nearly perpendicularly. The malar bone is very short. The incisive foramina are much larger, extending behind to between the anterior extremity of the first molars. The palato-maxillary suture is between the line of the posterior end of the second molars,* instead of the first, as in the Norway rat; the palatine bone itself is curiously excavated on each side of a median crest, with two foramina at the bottom of each excavation.

The lower jaw has the ramus quite convex externally, the posterior end of the incisor protruding on the outside, just below the notch between the coronoid and condyloid processes and high above the last molar, instead of terminating just behind it, as in the Norway rat.

The species of *Sigmodon* are confined to the southern portions of the United States—from Carolina, westward, to western Texas.

SIGMODON HISPIDUS, Say & Ord.

Cotton Rat.

Sigmodon hispidus, SAY & ORD, J. A. N. Sc. Phila. IV, II, 1825, 354; pl. x, f. 5—8, (read March, 1825.)—IB. Zool.

Jour. II, 1825, 296; pl. x, f. 5—8.

WAGNER, Suppl. Schreb. III, 1843, 556.

AUD. & BACH. N. Am. Quad. I, 1849, 229; pl. xxx.

Arvicola hispidus, GODMAN, Am. N. H. II, 68.

Arvicola hortensis, HARLAN, F. Am. 1825, 138.—IB. Med. and Phys. Res. 1835, 49.

? *Arvicola ferrugineus*, HARLAN, Am. Jour. Sc. X, Feb. 1826, 285.—IB. Med. and Phys. Researches, 1835, 57.

SP. CH.—Tail less than the trunk. Color above, reddish brown, lined with dark brown. Claws very strong.

This species is about half the size of a Norway rat, *Mus decumanus*. The head is rather blunt and compressed. The ears are large, nearly orbicular, the antitragus much developed, covered on both sides with short hairs, except around the auditory aperture, which is naked. The tail is shorter than the body, exclusive of the head, covered with short stiff appressed hairs, which do not conceal the annuli, and with a very slight tuft at the end. The third finger is longest, the fourth not appreciably shorter; the claw of the fifth reaches a little beyond the ante-penultimate articulation of the fourth finger; that of the second to the end of the ball of the third. The central three toes are equal and much the longest. The tips of the claws of the first and fifth are about on a line; but the first claw being considerably the larger, its toe is shorter, though set further back. Soles entirely naked from the heel.

The prevailing color of the upper parts is a reddish or rusty brown, varying a little in tint, and lined with dark brown; the sides are brightest, and their color extends on the outside of the limbs to the fingers of the hand and the tarsus. The under parts generally, with the

upper surface of the hind feet, dirty grayish white. There is no marked difference in the colors of the tail, which is dusky above and paler beneath.

The hairs are everywhere plumbeous at base, this color being darkest above. On the upper parts they are pale reddish brown at the ends, with the extreme tips brown; the principal mixture of dark brown is, however, produced by long hairs of this color projecting far beyond the others.

Description of a specimen in alcohol.—In general form, this animal closely resembles the large *Arvicolae*, the hair being long and coarse, and not forming a smooth, compact, glossy coat, as in the true mice generally. The tail is longer, and the ears larger, however, than is usually seen in the field mice.

The head is rather narrow, but the muzzle is very blunt, and hairy, even anteriorly; the septum and region immediately around the nostrils alone being naked. The nostrils are termino-lateral; the septum with a groove, which is continued into the acute emargination of the upper lip.

The ears may be called very large, but are much covered by the long adjacent hairs of the head; they are quite orbicular, as broad as high, the convexity and posterior half of the concavity coated with quite long coarse hairs which lie flat, but do not form a glossy, smooth coat. The antitragus is well developed, elongated and quite valvular in character, capable of closing the meatus completely.

The feet are quite large; the thumb of the fore foot is rudimentary, but provided with a long, flat nail, which completely covers it. The third and fourth fingers are longest; the second claw reaches to the base of the third; the fifth to the base of the second; on the hind foot, the central three toes are longest, and nearly equal; the first and fifth much shorter, their claws reaching only to the bases of the adjacent toes. The whole under surface of the hind foot is perfectly smooth from the extreme heel, and not at all granular as far as the first tubercles; beyond this the skin is rather finely tubercular, with larger tubercles interspersed; of these, there are six, two at the angles of intersection of the second and third, and third and fourth toes; one each at the bases of the first and fifth; and another behind each of these, near the inner and outer edges, the latter most posterior. On the fore foot there are five tubercles: one at the junction of the third and fourth fingers; at the bases of the second and fifth; and two on the posterior edge of the palm. These last are much largest; the others, as well as those on the hind foot, being quite small, and appearing as if set in the surrounding skin. The skin of the soles is blackish, the tubercles darker.

The tail is rather less than the body without the head; it is conical; thick at base, and annulated. The hairs springing between the annuli, conceal them to a great extent. (2683.)

The tubercles on the feet of *Sigmodon* are much smaller than those of *Neotoma*; the entirely naked soles and black skin of the former are also conspicuously different.

This species was described as *Sigmodon hispidum* by Say and Ord, and as *Arvicola hortensis* by Harlan, at nearly the same time; the former name, however, has priority in point of actual publication. It is very probable that the *Arvicola ferrugineus* of Harlan belongs to the same species, though this is not quite certain.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.									
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.	Height of ear.
1237 ¹ to 1249	}		Society Hill, S. C.		M. A. Curtis & Sons	Skins										
1984 ² to 1992			do.		do.	do.										
979			do.	Nov. 1855	do.	do.										
1303		2105	♂	do.		do.	do.									
1304	2106		do.		do.	do.										
1306	2108		do.		do.	do.										
1307	2109		do.		do.	do.										
2683			do.		do.	In alc.	.70	1.45	1.67	5.45	3.73		.62	1.24		.70
2684			do.		do.	do.	.60	1.25	1.46	4.75	3.25		.60	1.15		.60
2685			do.		do.	do.	.60	1.25	1.42	4.65	3.20		.58	1.15		.60
2686			do.		do.	do.	.65	1.30	1.47	4.90	3.40		.61	1.20		.70
2687			do.		do.	do.	.65	1.30	1.48	4.80	3.45		.60	1.20		.70
2688			do.		do.	do.	.66	1.30	1.55	5.05	3.30		.63	1.20		.60
2689			do.		do.	do.	.60	1.25	1.40	4.90	3.26		.55	1.17		.60
2690			do.		do.	do.	.65	1.30	1.50	4.80	3.35		.56	1.20		.70
2691			do.		do.	do.	.70	1.45	1.60	5.90	3.75		.60	1.25		.70
2692			do.		do.	do.	.65	1.35	1.50	5.05	3.30		.60	1.20		.60
2693			do.		do.	do.	.62	1.30	1.45	4.50	3.23		.58	1.20		.70
2694			do.		do.	do.										
35			Orangeburg, S. C.		Dr. Bachman	Skin										
20			Liberty co., Georgia		Major Leconte	do.										
34			do.		do.	do.				6.00	4.08	4.25				
73			do.		do.	do.										
281	1675		Georgia		J. J. Audubon	do.	.75	1.50	1.75	5.66	3.50	3.58		1.20	1.42	.60
1625			St. Simon's island, Ga.		Dr. S. W. Wilson	do.										
2701			do.		do.	Alcohol								1.19		
909	1955		Indian river, Fla.		G. Würdemann	do.										

¹ 13 specimens.² 9 specimens.

SIGMODON BERLANDIERI, Baird.

Sigmodon Berlandieri, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 333.?? *Arvicola texiana*, AUD. & BACH. N. Am. Quad. III, 1853, 229; pl. cxlvii, f. 2.

SP. CH.—Tail equal to or longer than the trunk. Color above, grayish yellow brown, lined with black. Claws weaker than in *S. hispidus*.

This species is about the size of *S. hispidus*, though perhaps more slender, and with a longer tail. The ears are large and rounded, projecting beyond the long hairs of the head; the antitragus well developed; the surface of the ear with short close hairs. The whiskers are about the length of the head. The tail is nearly equal to the trunk in length; it is covered with narrow annuli not concealed by the few hairs which spring from between them at regular distances; they are narrower and more numerous in a given space than in *S. hispidus*, and less concealed by the hairs. The third finger is longest, the fourth scarcely shorter; the claw of the second extends to the end of the bulb of the third, that of the fifth barely to the base of the claw of

the fourth. The central three toes are equal and longest, the first and fifth extend to the same distance (just beyond the base of the longer toes) and rise nearly opposite each other. The first claw is, however, the larger; the palms are broad and naked from the heel.

The upper parts, generally, are of a gray yellow brown, lined with dark brown, a little clearer along the sides. The under parts, with the top of the hind foot, are dull grayish white. The hairs everywhere are plumbeous at base, this color above becoming darker near the yellowish brown ends, which are tipped with black. Everywhere interspersed on the back are many longer hairs entirely black.

Measurements.

	566 ♀	
	Inches.	Lines.
Nose to occiput.....	1	8
eye.....		8½
ear.....	1	6
root of tail.....	5	8
end of outstretched hind legs.....	7	-----
Tail, from root to end of vertebræ.....	4	7
Ears, height posteriorly.....		6½
internally above notch.....		7½
Arm, between claws across shoulder.....	4	2
fore foot to end of claw.....		7
longest claw.....		1½
Leg, from knee joint to end of claws.....	2	1½
tibia.....		8
hind foot from heel to end of claws.....	1	2½
longest claw.....		2
longest toe and claw.....		4½

This species is readily distinguishable from *S. hispidus* by the much lighter color above, where it is grayish yellow brown, instead of distinct reddish brown; the tail is considerably longer and covered by finer annuli. The toes are shorter and the metatarsus shorter, while the feet are nearly the same length. The claws, however, are much weaker. The tail is composed of twenty-one vertebræ.

This species bears some resemblance to the *Arvicola texiana* of Audubon and Bachman, and may possibly be the same. According to these authors, however, this last mentioned species is of a very different genus; the tail is very little shorter than the head and body (4 inches to 4½,) the hind feet 1.25 inch; the back brownish yellow, spotted with irregular small blotches of black, a faint, obscure stripe of black on each side; sides reddish brown, belly whitish gray. All these features, if properly belonging to the species, render it very different from *S. berlandieri*, although it is quite possibly a *Sigmodon*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—		
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Length of fore ft.	Length of hind ft.	Length of skull.		Width of skull.	Height of ear.
566	1667	♂	Rio Nzas, Coahuila, Mex.	1853.	Lt. Couch	Skin.			1.67	5.67	4.60	.60	1.20	1.33		.60	
564			Sta. Caterina, N. Leon, Mex.	do.	do.	do.											
574			Tamaulipas, Mex.	do.	do.	do.											
563			do.	do.	do.	do.											
562			Santa Rosalia, Mex.	Mar., 1853	do.	do.											
2681			Matamoras		do.	In alcohol	.55	1.18	1.38	4.50	2.40	.50	1.15			.70	Dr. Berlandier.
8	1672		West of San Antonio	1851.	Col. J. D. Graham	Skin								1.43			J. H. Clark.
232			Eastern Texas.		Maj. W. H. Emory.	do.											do.
2682 ¹			Ringgold Barracks.		do.	In alcohol	.65	1.30	1.46	5.66	2.93	.54	1.18			.70	A. Schott.
1034	2213		Los Nogales, Sonora		do.	Mounted.								1.39	.81		Dr. Kennerly.

¹ Taken from the stomach of a snake.

SUB-FAMILY ARVICOLINAE.

Incisors as broad as deep, molars $\frac{3-3}{3-3}$, rootless, or with very short roots composed of alternating triangular prisms. Ante-orbital opening moderate. Intermolar portion of the palate descending below the level of the anterior portion; the space between incisors and molars excavated. Descending ramus of the lower jaw situated above the plane of the crowns of the molars.

To the above general characters may be added: ears short and generally hidden in the fur. Muzzle broad and rounded. Tail short, less than the body, sometimes not as long as the head, mostly clothed thickly with hair. Whiskers (as in *Murinae*) in five horizontal series.

The genera hitherto described of this sub-family are *Arvicola*, (in its most general sense,) *Myodes*, and *Fiber*, the species of which are confined to the northern half of the globe—*Myodes*, in fact, being the most northern form of Rodents known. All are abundantly represented in North America, though *Myodes* proper has not yet been positively detected within the limits of the United States. *Fiber* is peculiar to this country.

In external appearance, the *Arvicolinae* differ from the *Murinae* in the blunt snout, (not pointed,) short ears nearly concealed in the fur, very short and hairy tail, &c. The skull is shorter and deeper than in the *Murinae*, much broader; greatly compressed in the inter-orbital region. The incisors are much broader, sometimes wider than deep. The molars are rootless, growing constantly from a persistent pulp; they are composed of triangular prisms aggregated together.

The genus *Neotoma*, which has molar teeth similarly constituted, but provided with roots, serves to connect closely the *Arvicolinae* and *Murinae*, although in all other respects of shape, size of eyes, ears, tail, &c., it accords perfectly with the rats.

In very old individuals of some forms of the *Arvicolinae*, the supply of new tooth matter sometimes diminishes, and finally stops altogether; this is accompanied by the formation of irregular fangs, which may, however, be readily distinguished from the genuine fangs of the rooted molars, by their irregular form. Genera belonging to other sub-families are liable to the same condition, as in the case of the Beaver.

To mention more fully the characters of the *Arvicolinae*, it may be stated that the anterior root of the zygoma is thrown up from the plane of the palate in the form of a thin plate, obliquely placed; its lower edge is emarginated. The malar bone does not form part of the outer boundary of the ante-orbital opening, which is rather wider below than in the *Murinae*, and has its upper division bounded below by a lamellar process, bent back from the upper maxillary bone. The malar bone is broad and vertically compressed, and does not extend back far enough to enter into the glenoid cavity.

The temporal bone is produced anteriorly and laterally, so as, in some species, to form an angle.

The palate is more or less contracted in front, the inter-molar portion (with the skull in a natural position) descending generally below the level of the anterior portion. The palate is generally moderately broad, and but slightly contracted between the anterior molars; it does not extend as far back as in the rats, but ceases about opposite the middle of the last upper molars.

The incisive foramina are large, and situated partly in the maxillary and partly in the inter-maxillary bones.

There are three genera of this sub-family, all of them found in North America, which may be briefly characterized as follows:

Arvicola.—Field mice. Size small; soles naked anteriorly. Tail moderately short, cylindrical, hairy.

Fiber.—Muskrat. Size large; soles naked; tail long, and much developed in a vertical direction; nearly naked.

Myodes.—Lemmings. Size of *Arvicola*; tail very short; soles hairy.

ARVICOLA, Laccp.

"*Arvicola*, LACEPEDE, Tableau, 1803."

Soles of the feet nearly naked. Tail as long as the hind foot, usually longer, from $\frac{1}{4}$ to $\frac{2}{3}$ the length of the body; cylindrical, or nearly so; well covered with hairs. The posterior upper molar composed of five or six prisms; the posterior lower one of three; its re-entrant angles opposite to each other.

The above characters will serve to separate the *Arvicolas* from *Fiber* and *Myodes*, although there is abundant room to make several subdivisions. The species of the genus are distributed over the northern hemisphere of America, Europe, and Asia, none, as yet, having been detected in South America or Africa, as, indeed, is the case with the whole family. Many species are eminently aquatic, and have a valve to the ear in the form of a much developed antitragus, by which it can be closed when under water; others live in dry pastures, or high lands, where they frequently do great mischief by their consumption of grain and fruit, or by destroying young trees in eating off the bark.

The upper incisors are stouter than the lower, the latter much rounded. The molars decrease from before behind, and the lines of their outer edges at the same time approximate behind so as nearly to intersect. Each is composed of triangular prisms placed in two alternating series, so that the edges have a zigzag or serrate appearance. These prisms vary somewhat with the species, and afford excellent specific characters. The molars are all rootless, except in one form represented in this country by *Arvicola gapperi*.

The skull differs strikingly from that of *Mus* in being much shorter and broader, with a sudden contraction of the inter-orbital region of the frontal bones. The zygomatic arches are much shorter, and stand more apart. The ante-orbital opening at the anterior root of this arch is rather broader than in *Mus*, and the thin lamellar plate forming its outer border, instead of projecting considerably beyond the junction of the upper anterior branch of the zygomatic arch with the frontal bone, is emarginated concavely just below this region, not extending, in fact, beyond the naso-frontal suture.

The palate presents considerable differences, some of which have already been adverted to.

The stomach is provided with a strong constriction, dividing it into two halves; on the right one there is an additional swelling, like a third stomach. The cecum is large, with many constrictions. The colon is twisted spirally for a considerable part of its course. The gall bladder is generally present. The end of the rectum is surrounded by a gland, which discharges a fetid fluid into it, near the anus.

The testicles, prostate, and Cowper's glands have an enormous development, especially during the rutting season.

The genus *Arvicola*, or field mice, embraces many species, spread over the northern hemisphere of America, Europe, and Asia, and in the number of individuals probably far exceeds any other among mammals. Distributed uniformly throughout the countries enumerated, some species inhabit the vicinity of the water, others occupy the high lands, while others again frequent rocky elevated regions, or even Alpine mountain heights. The thick moss and sphagnum swamps of the regions in the vicinity of the arctic circle are said to abound in species both of *Arvicola* and *Myodes* to an extraordinary degree, and to furnish the starting points of the armies of Lemmings which play so conspicuous a feature in the natural history of the north.

In more southern countries the field mice sometimes multiply and swarm to an enormous extent, appearing suddenly in regions where but few were previously supposed to exist. In America the injury to young trees and shrubs from the ravages of field mice has been sometimes very great; but it is of European species that the most extraordinary accounts are given as to numbers and destructiveness. Thus, in the year 1837, four-fifths of the entire harvest in the province of Piombina, in Italy, were devastated by the field mice, which had been driven to the high grounds by heavy floods in the meadows. In a single province in Germany, in 1822, 1,570,000 mice were captured in fourteen days, as shown by official reports.

As will be seen hereafter, there is good reason to concur with Keyserling and Blasius in separating a genus, or, at least, sub-genus *Hypadaeus*¹ from *Arvicola*. The former differs little externally from *Arvicola*, except, perhaps, in the more prominent ears, and some other minor points. In all, however, the head is short and blunt, the body stout, sometimes very much so. The upper lip is bifid, and a shallow groove extends to the nose and passes between the naked nostrils, which swell out a little on each side. This groove, when the skin is stretched apart, is seen to be naked; but in the ordinary condition, the region between the nostril and the lip appears to be densely furred; the hair also extends to the extreme end of the muzzle, leaving only a naked space around the nostrils. The lips are tumid and hairy to within the mouth. The bristles are in five horizontal series. The ears are variable in size, usually concealed in the fur; the surfaces covered with hair, or nearly naked. The eyes are very small.

The fur is generally long and loose, sometimes short and compact. It is always plumbeous at the base.

The thumb is obsolete externally, or very rudimentary, the corresponding claw almost springing directly from the skin. It is variable in size and shape; sometimes conical, sometimes flat, always inconspicuous. The third and fourth fingers are longest; the second and fifth shorter. The palm is perfectly naked. The fore feet are half as long, or more, than the hinder. The hind foot has the sole hairy for one-half or one-third its length from the heel, or as far as the tubercles. The first and fifth toes are inserted on much shorter metatarsals than the second, third, and fourth, which are longest.

The tail is variable, sometimes nearly half as long as the head and body; more usually from one-third to one-fourth, or even less; never shorter than the hind foot, as in the Lemmings. It is sparingly or densely covered with stiff hairs.

In *Hypadaeus*, in addition to the characters embraced in the preceding description, the general form is slenderer than in most *Arvicolae*, and the appearance more like that of *Sigmodon*. The size is small; the head rather narrower and pointed. The ears are very large, projecting far beyond the fur, and well covered with short, close hairs, which have almost the finish of the squirrel's ear. The antitragus is large. The feet are small, the anterior more than half as long as the posterior, and with naked palms and small thumb claw. The sole is hairy for the

¹The genus *Arvicola* was established by Lacépède in 1803, according to the Nomenclator Zoologicus of Agassiz. I have not been able to ascertain upon what particular species the genus was based; but it was applied by him both to *A. amphibius* and *A. arvalis*, types of two very different sections. In 1811, Illiger, in the Prodrum Syst. Mammalium et Avium, made the genus *Hypadaeus*, and included in it as types the *Mus lemmus*, *amphibius*, and *arvalis*, or nearly the same as *Arvicola*. The genus *Lemmus* was proposed by Linck, and was of still greater extent as defined by Fischer. These genera were generally considered as synonymous until Keyserling and Blasius, in Wirbelthiere Europas, 1842, defined two sub-genera, *Arvicola* and *Hypadaeus*, and restricted the latter to the species with partly rooted molars, having *Arvicola glareola* as the type. Not having the means of reference to the works of Lacépède and Linck, I am unable to say whether *Lemmus* should be used in preference to *Hypadaeus*, or whether it belongs more strictly to the true Lemmings, and in this case whether or not it supersedes *Myodes* of Pallas.

posterior third. Tail as long or longer than the head; the hairs on the posterior third longer than those anteriorly.

In the American specimens hitherto examined, the tail is twice as long as the hind foot, less than one-third the head and body, darkest at the tip.

The skull of the *Arvicola* possesses certain very uniform cranial characteristics, although variations in subordinate points afford the means of establishing subdivisions which greatly facilitate the comprehension of the species. It will not do, however, to attach too much importance to all the variations of bones and teeth, as in no group do we find a greater latitude within specific limits. It is only by the examination of many specimens that we can seize an average of conditions that may be considered as typical.

The principal points in which the subdivisions of *Arvicola* differ, are in the extent of the nasal branch of the intermaxillary bone, the nature of the bony palate, the number of closed triangles in the molar teeth, with the position and number of the salient angles, and some other features hereafter to be mentioned. These usually vary little in different species of one group. The specific variations are in the proportions of the skull, the shape of the occipital foramen, the size of the teeth, and rarely in the outline of the enamel folds. I have not been able to appreciate any constant difference in the sexes, but the adults differ from the young in the size and proportions of the skull, the greater angularity of outline, &c.

As a whole, the skulls of American *Arvicolae* differ from the European, as in only one species (*Arvicola agrestis* from Sweden) have I found an accordance in every general respect with an American. In the above mentioned *Arvicola* the skull is almost entirely like that of *A. riparia*, although certain specific differences may be noted. An exception must, however, be made for the species of *Hypadaeus*, in which there is a close concordance.

After an examination of many skulls of *Arvicolae*, European and American, (over 20 species,) I am inclined fully to agree with Keyserling and Blasius, in separating *Hypadaeus* from *Arvicola*, and even to raise it to generic rank. It is true the differences are not very great, but they are strongly marked and constant; and in a group where the number of closely allied species is so large, what would otherwise be a trifling character may take an important place. I find also some characters to distinguish the two, to which the above mentioned authors do not allude, and which are even more striking than any they mention. The chief external feature of *Hypadaeus* is in the large ears prominent above the fur, the surfaces densely coated with short, close hair, as in the squirrels. The skull differs in the palatine vault, the double roots to the molars, the shape of the crown, and some other features.

The skull of the restricted genus *Arvicola* is short and broad, as well as high. The length is a little more than twice the greatest width, which occurs at about the middle of the axial line. Viewed from above, the muzzle is narrow and its outlines nearly parallel; it occupies the anterior third or fourth of the head, which suddenly widens along the anterior wall of the zygomatic arch, and then curves round to the temporal region. The confluent orbital and temporal fossae are large, their posterior internal boundary generally sharply angular in the adult. The nasal bones are about one-fourth the length of the head; the nasal branch of the intermaxillary is as long or a little longer than the nasal bones, and reaches to a point between the roots of the zygomatic arch or a little beyond, as far as the small lachrymal bone, or to the inter-orbital region. The occipital foramen is sometimes higher than wide, and sub-triangular, or as high as wide, and rounded. The auditory bullae are large. The bony palate is nearly plane between the two anterior molars of each side; opposite the last molar on either side it is

abruptly indented by an elongated fossa situated against the root of the posterior molar; the two leave between them a short azygos process. Between these fossae is a fissure which reaches to a point opposite the middle of the molar. There is thus a step from the plane of the bony palate to the bottom of the fossa, and another thence to the base of the skull or body of the sphenoid. The palatine lateral outline is considerably excavated anterior to the molars, rising rapidly to the incisors. The incisive foramina communicate with each other, and extend from the anterior molar over two-thirds the distance to the incisors.

The lower jaw is short and massive; the distance from the molars to the tips of the incisors about one-third the whole length. The condyloid process is long, its sides sub-linear and narrow, the coronoid process curved, and rising as high or higher than the level of the condyle. The descending ramus is long, narrow, and bent upwards, with, at the same time, an outward twist.

The incisors are stout, the upper ones rather short, rounded off anteriorly a little on the internal edges, more extensively externally, so as to cut down to the middle line of the lateral outline. Sometimes the anterior surface is more plane, and only one-third of the anterior surface visible from the side.

The molars are all prismatic, with acute salient and re-entrant angles on each side, and without roots, even in the adult, the teeth appearing to grow for a considerable time from a persistent pulp. Each tooth is composed of an aggregation of triangular prisms, more or less alternating with each other, or, more strictly, of a prism of dentine with a continuous enveloping wall of enamel, which is indented in subacute re-entrant angles which either alternate or are opposite. When the enamel of opposite sides meets, the apex of an angle against a side or another apex, the two lines generally fuse into one no wider than either separately; this is especially the case in the upper jaw. Sometimes, however, both are distinguishable.

The anterior outline of each upper molar is a transverse, slightly curved line, which is itself the longest side of a spherical closed triangle. The anterior molar, in all species, exhibits four succeeding triangles—two internal and two external—the first being internal, the second external. In the second molar, the anterior triangle is succeeded by either three or four lateral triangles, and is very similar to the first molar, except that here the first one is external, not internal. Where there are but three lateral angles, there is one internal and two external. The posterior molar has one internal and one or two external angles, with either a crescentic loop ending the tooth, or else a V or Y-shaped lobe. When the lobe is crescentic, the convexity is external, the posterior outer triangle being borne on its back, or just at the stem of the crescent; the anterior loop of the crescent forms one of the internal salient angles; the posterior is the last internal or terminal salient angle; between the two there is sometimes a third salient angle.

The lower molars are somewhat similar to the upper, but the transverse triangles are posterior, not anterior. In the anterior molar there are two or more lateral triangles on either side anterior to the transverse one, and an anterior trefoil loop with one or more lateral indentations. The tooth varies in exact pattern with the group. The middle molar has one posterior transverse triangle, and generally two lateral alternating ones on either side anterior to this. Sometimes one or both lateral triangles are opposite to and confluent with each other, giving rise to one or two additional transverse triangles; if to two, then the whole tooth is composed of three transverse triangles. The posterior molar is narrower than the rest, and always composed of three transverse spherical triangles or ellipses. This last lower molar and first upper one are very unchangeable; all the rest vary more or less.

Although I have not had the opportunity of examining all the American *Arvicolae*, they will, probably, all be found in one or other of several groups which will hereafter be characterized. Externally, the differences are in the size and shape of the feet and ears, the length of the tail, the condition of the fur, &c. The variations of the skull have already been referred to.

Hypudaeus.—The description of *Arvicola* has necessarily involved that of many points common to it and *Hypudaeus*, and it will, therefore, here be only necessary to advert to the characteristic features. The most striking of these is seen in the molars, which, in the adult, have two fangs or roots, each separated by a slit sometimes nearly half the length of the tooth. Some other points, to which attention may be called, are as follows: The nasal bones and nasal branches of the intermaxillary are of equal length, and scarcely extend beyond the anterior insertion of the palatine arch, never to the interorbital region. The interparietal bone is acute angled laterally, not truncate. There is a slight concavity in the top of the head anterior to the parietal bones. The posterior end of the bony palate is a projecting shelf, with the wings of the sphenoid and palatine bones dipping and disappearing under it by sinking to the level of the base of the head. There is, therefore, no mere fossa on each side of the anterior molars, but the whole intermolar space is broadly excavated and open. The incisive foramina are long and wide. The coronoid process of the lower jaw is long but low, and does not reach to the level of the condyle.

The anterior upper and posterior lower molars are much as in *Arvicola*. The middle upper molar has one internal and two external triangles. The posterior molar is shaped much as in the *Arvicola riparius* section, viz: one anterior triangle, two external and one internal, with a posterior crescent, the two loops of which form the two last internal salient angles. The corners of the angles are all rounded off, however. The middle lower molar, like the posterior, is composed of three transverse triangles, although it is considerably wider. The third molar has a posterior transverse triangle, and the lateral salient angles are more or less opposite each other, so that their dentine is confluent with transverse triangles; there are usually two of these lateral open triangles on each side, and a trefoil loop anterior to all.

The incisors are narrower than usual; the entire skull narrow and depressed. The line of molars is very short and narrow, not more than one-fifth the length of the skull.

Thus far, I have only found one, perhaps two, species of *Hypudaeus* in America. There are, however, several in Europe, in addition to the typical *H. glareola*, upon which the sub-genus was founded. Among them are *H. rubida* and *H. rutila* of northern Europe, so similar to *A. gapperi*. *Arvicola arvalis* of southern Europe, and *Arvicola agrestis*, of northern Europe, supposed to be identical with *A. arvalis* of authors, fall legitimately in the other genus.

To sum up, therefore, in a few words, the characters of *Arvicola* and *Hypudaeus*, we have the following diagnoses:

ARVICOLA.—Molars rootless. Bony palate with a fossa on the inner side of each posterior molar, and between these fossae an opening to the basi-sphenoid one-third the intermolar space. Coronoid process as high as the condyle of the lower jaw. Ears more or less concealed, coated with rather loose hairs.

HYPUDAEUS.—Molars with two roots each. Bony palate behind a projecting shelf; no fossae, but the entire space between the posterior molars excavated and open to the basi-sphenoid. Coronoid process not as high as the condyloid. Ears very distinct, covered with short close hairs.

Although, by defining *Hypudaeus* as distinct from *Arvicola*, the labor of ascertaining the species is somewhat lessened, still enough are left in the latter to render it very desirable to construct further subdivisions. I have, after a somewhat protracted examination, succeeded in finding characters by which the *Arvicola* may be thrown into five or six smaller groups, each

presenting features which are readily appreciable. These I shall now characterize, after presenting their chief features in a tabular abstract. In this I shall include *Hypudaeus*, for the sake of showing some of its peculiarities, as compared with those of the different groups mentioned.

ANALYSIS.

Ears hidden, small ; margins incurved, surface naked.....	B.	
“ “ margins not incurved	D.	
“ larger, scarcely hidden, not projecting conspicuously	A. C.	
“ projecting conspicuously.....		<i>Hypudaeus</i> .
Fore feet about half the length of hinder, their claws not larger than posterior.....	A. B. C.	<i>Hypudaeus</i> .
“ two-thirds the hinder, fore claws largest.....	D.	
Soles with five tubercles.....	B. C. D.	
“ six tubercles.....	A.	<i>Hypudaeus</i> .
Interparietal bone, subtruncate laterally.....	A. B. C.	
“ acute angled.....	D.	<i>Hypudaeus</i> .
Second upper molar with two internal triangles.....	A.	
“ “ one internal triangle.....	B. C. D.	<i>Hypudaeus</i> .
Third upper molar with two external triangles and a posterior crescent...	A.	<i>Hypudaeus</i> .
“ “ one exterior triangle and a posterior V or Y.....	B. C. D.	
Anterior lower molar with three internal and two or three external closed triangles	A. B.	
“ “ with two internal and one external closed triangle	C. D.	
Anterior lower molar with salient angles mostly alternating.....	A. B. C. D.	
“ “ “ opposite.....		<i>Hypudaeus</i> .
Middle lower molar with one posterior triangle and two lateral on each side, lateral salient angles alternating.....	A. B.	
“ with one posterior triangle, one anterior, and one lateral on each side.....	C. D.	
“ with an anterior triangle, a middle, and a posterior..		<i>Hypudaeus</i> .

In throwing the various species of the genus *Arvicola* (as restricted) into sections, I shall be obliged, for convenience of reference, to give names to these, although I do not present them as of even sub-generic value. It is, however, very possible that careful anatomical investigations of the American species, which I have not now time to make, may render it expedient to adopt many more sub-genera, or even genera, than are at present admitted. Whoever will undertake the critical revision of the entire sub-family in all its species, whether Old World or New, and show exactly their relationships and limits, will do what, more than any other labor, will tend to relieve the study of the smaller mammals from many of its embarrassments. There is no other group of Rodents in which the species are so difficult to define, nor is there any in which the representatives from the two continents approach each other so closely. I have before me a large proportion of all the species known, but the limited time at present at my command will not allow me to attempt any monographic investigations. Even of the species of American *Arvicolae* I shall attempt no critical revision, but satisfy myself with giving those which appear

positively distinct in the collections before me, without any special synoptical arrangement, as in other genera. Much more material and labor will be required before this can be done properly.

In giving the subdivisions of *Arvicola*, I shall precede them with a brief diagnosis of *Hypudaeus*, referring for particulars to the preceding pages. It is to be understood that, though no special prominence is given in the descriptions, yet that *Hypudaeus* is much more distinct from sections A, B, C, and D, than these are from each other, and consequently more likely to be erected into generic rank.

HYPUDAEUS, Ill.¹

Ears large, broad, and prominent. Margins not inflexed. Antitragus moderate, though capable of closing the meatus. Fore feet about half the length of the hinder. Soles with six tubercles, the posterior rather small. Tail about two and a half times the length of the hind foot; considerably longer than the head. Female with four pairs of teats, two pectoral and two inguinal.

Further details concerning this section will be found in the preceding pages, where its characters are compared with those of the restricted genus *Arvicola*. But one species, *H. gapperi*, is thus far known in North America. It constitutes an excellent connecting link between the arvicoline *Hesperomys* and *Sigmodon* and the *Arvicolae* proper.

ARVICOLA.—A. HEMIOTOMYS, Selys.²

Ears large and broad, with a highly developed antitragus. Feet large. Anterior rather less than half the length of posterior. Claws moderate, the anterior not longer. Soles with six tubercles; the posterior very large. Females with four pairs of teats, two pectoral and two inguinal. Second upper molar with two internal triangles, third with two external. Anterior lower molar with three internal triangles, and two or three external.

Embracing the largest American species. Hind feet very long. Toes long, inserted obliquely on the metatarsus, as in the muskrat, for swimming. Fore feet a little more than half as long as the hinder; their claws not longer than the hinder; posterior third of sole hairy. Ears large, though more or less concealed by the fur, coated with long hairs. Antitragus a large, almost semi-circular, valve, capable of closing the meatus. Tail considerably longer than the head, usually about one-third the head and body. Plumbeous portion of the hairs uniform throughout. Tail not darker at tip.

Skull rather narrow. Interparietal bone truncate laterally. Nasal branch of intermaxillary very little longer than the nasal bone, and barely reaching to the interorbital region. Second upper molar with five closed triangles; the two last sometimes sub-confluent. The third upper molar with one anterior, two external, and one internal closed triangles, and a posterior C-shaped or sub-crescentic loop, the convexity external, sometimes with an additional internal spur. Anterior lower molar with one posterior triangle, three internal, and two or three external, with also an anterior trefoil loop. When there are three external triangles, the outer lobe of the loop is changed to a triangle. Middle lower molar with five triangles.

The shape of the crescent loop of the posterior upper molar may vary in the same species; sometimes with two lobes only, sometimes with a third inner lobe, making three salient inner angles. Sometimes the posterior lobe is not bent inwards, but is simply directed backwards,

¹ *Myodes* of Selys Longchamps, Études, 87.

² *Hemiotomys*, Selys Longchamps, Études de Micromammalogie, 1839, 85. Constructed to accommodate the European *Arvicola amphibius, terrestris*, &c. The skull of these, however, is more like that of section C.

with an internal concavity. The difference of two or three external triangles to the anterior lower molar depends only on the greater or less indentation of the anterior re-entrant angle, and may vary in the same species.¹

It is to this group that by far the greater number of the American species belong, especially those of largest size. While new species remain to be discovered, it is highly probable that many of those indicated as distinct will, on a critical examination, prove to be the same. The law of specific character in our American species has not yet been fully ascertained, but it is beyond a doubt that species may vary considerably (even if within fixed limits) in dimensions in the size and amount of hair on the ears, the length of the tail, and the color of the fur.

The species of this group described in the following pages are:

WEST COAST AND ROCKY MOUNTAINS.

Arvicola townsendii,
montana,
longirostris,
occidentalis,
californica,
edax,
modesta.

EASTERN NORTH AMERICA.

Arvicola riparia,
 “ *longipilis*,
breweri,
rufidorsum.

ARVICOLA.—B. CHILOTUS, Baird.

Ears small, orbicular, the marginal portion or helix incurved all round, bounding a distinct fossa innominata; the upper and lower roots so close together as to be confluent anteriorly, and thus enclosing the meatus entirely in the anterior rim, however low; surfaces of the ear almost naked; tubercles of soles fine, as in *A. pinetorum*; fore feet but little more than half the hinder; fore claws not longest; tail about one-third the head and body. Second upper molar, with one internal triangle; third, with one external; anterior lower molar with three internal closed triangles and two or three external.

Size very small. Fur close, short. Ears short, naked, with scattered short hairs. Feet rather small and weak; anterior little more than half the posterior; claws not longer. Tail longer than the head.

Skull rather broad. Nasal branch of intermaxillary as long as the nasal bone, and not reaching to the inter-orbital region. Interparietal bone subtruncate laterally. Occipital foramen round; as wide as high. Second upper molar, with four closed triangles. Posterior upper molar, with one anterior triangle; one lateral on either side, and a posterior Y or trefoil. The anterior lower molar has one posterior triangle, three internal and three external triangles, with an anterior trefoil loop. Middle lower molar with five triangles, the opposite salient angles alternating.

I know of but one species of this group, the *A. oregona* of Audubon and Bachman.

¹*Arvicola agrestis*, from Sweden, in the character of its skull and teeth, belongs strictly to the group having *A. riparius* for the type. The anterior lower molar has three lateral triangles on each side.

ARVICOLA.—C. PEDOMYS, Baird.

Ears small, very broad; the anterior edge not inflected. Antitragus well developed into a valve. Feet very broad; anterior about half as long as posterior; claws weaker than in section D, the anterior shortest; soles with five tubercles only; the tubercles well defined, elevated, as if set in the skin; the posterior very small. Tail, with the hairs, a little less than twice the hind feet; about equal to the head. Female with two pairs of teats, only; inguinal. Second upper molar with one internal triangle; third, with one external; anterior lower molar, with two internal and one external closed triangles.

Size large. Hind feet moderate. Toes short. Fore feet about two-thirds as long as the hinder, broad, and fossorial. Posterior half of sole hairy. Ears small, concealed, about half as long as the hind feet, sparsely furred near the margins. Antitragus very large. Tail a little longer than the head, less than one-third the length of head and body. Plumbeous portion of the fur becoming darker just before the brown tip. Tail dusker at the tip.

Skull moderately broad. Interparietal truncate laterally. Nasal branch of interparietal reaching considerably beyond the nasal bone to the interorbital region. Second upper molar, with four closed triangles, without any spur to the posterior. Third upper molar, with one anterior, one external and one internal triangle, with a posterior V. Anterior lower molar, with one posterior, two interior, and one exterior triangle, with an anterior lobe or trefoil, with two salient angles on each side. Middle lower molar, with five triangles.

The skull and teeth of *A. amphibia* resemble this, except that the anterior trefoil has but one indentation on each side, lacking the anterior shallow one. *A. ratticeps* has two lateral triangles on each side of the posterior upper molar, instead of one. The lower molars are much like those of *A. riparia*. *Arvicola agrestis* falls in the group to which *A. riparia* belongs.

At present I know of but three species for this section, *A. austera*, *cinnamomea*, and *haydeni*.

ARVICOLA—D. PITYMYS, McMurtrie.¹

Ears short; the anterior margin and concha not inflected. The antitragus scarcely valvular. Fore feet more than two-thirds the hinder. Fore claws longest. Hind feet very short, with five tubercles on the soles. The tubercles broad, low, conical, apparently like mere elevations of the skin. Tail scarcely longer than the hind feet; considerably shorter than the head. Female with only two pairs of teats, in the groin. Second upper molar with one internal triangle; third with one external; anterior lower molar with two internal and one external closed triangles.

Size very small; body slender, depressed, closely resembling the shrews in compactness of fur; fore feet stout, broader than hinder, nearly as long, with longer claws, &c. Ears very small, concealed; the meatus large, with a narrow auricle; rather thinly coated with longish hairs. Antitragus very small. Tail very short, considerably less than the head, scarcely exceeding the hind feet.

Skull very broad, width exceeding .60 of the length, convex above. Interparietal acutely angular laterally. Nasal branches of intermaxillary longer than the nasal bone, and reaching between the orbital spaces. Occipital foramen rounded, as broad as high. Second upper molar with four closed triangles, without any spur to the posterior. Third upper molar with only one lateral triangle on each side, an anterior triangle and a posterior V. Anterior lower molar, with two internal, one external, and one posterior triangle, and an anterior lobe or trefoil, with two salient angles on each side. Middle lower molar with four triangles, one lateral triangle on each side, the salient angles anterior to those opposite, and forming one triangle. Anterior surface of incisors nearly plane; one-third of lateral surface only covered with enamel.

The American type of this section is *A. pinetorum*, of which there appear to be several varieties.

¹ Smaller McMurtrie, Am. ed. Cuvier, Regne Animale, I, 1831, 434; perhaps equal in part to *Microtus*, Selys Longchamps Etudes de Micromammalogie, 1839, 86.

ARVICOLA (HYPUDAEUS) GAPPERI, Vigors.

Arvicola gapperi, VIGORS, Zool. Jour. V, June, 1830, 204; pl. ix.—(Canada.)

DEKAY, N. Y. Zool. I, 1842, 91.

SCHINZ, Syn. Mam. II, 1845, 252.

? *Arvicola fulva*, AUD. & BACH. J. A. N. Sc. VIII, II, 1842, 295.? *Arvicola dekayi*, AUD. & BACH. N. Am. Quad. III, 1854, 287.

SP. CH.—Size small and slender, about like that of the domestic mouse ($3\frac{1}{4}$ inches long.) Skull about .9 of an inch. Ear large, two-thirds the hind foot; prominent above the fur; well and closely furred, with short hair. Antitragus large. Tail vertebræ about twice as long as the hind foot. Back with a broad stripe of uniform bright rufous brown; sides sharply defined yellowish gray, mixed with brown; muzzle similar; beneath, dull yellowish white. Tail sharply bicolor, grayish and black mixed above, whitish beneath, dusky at the tip.

This species is of small size and of slender form compared with the others found in the northern and eastern States. The proportions are those of the house mouse, but the size is rather larger or about that of the white-footed mouse of the northern States.

The hair is soft and full, but rather short, measuring about .35 of an inch above and half as much below. The head is rather pointed, at least in the dried skins. The whiskers are as long as the head; black and grayish white. The eye is rather large, and appears situated nearer the nose than the ears. The ear is large, longer than wide, and clearly visible beyond the fur at all times, which it usually exceeds by nearly a quarter of an inch. Its length is more than two-thirds that of the hind foot. It is uniformly and densely coated on both sides with short hairs, and has almost the finish of a squirrel's ear, thus differing much from the common northern species. There is a large, nearly semi-circular antitragus, apparently capable of closing the meatus.

The feet are rather short, slender, and weak, the anterior long in proportion to the posterior, being more than half the length. There is a short, blunt claw enveloping the rudimentary thumb. The sole is covered with close fine hair from the heel to the tubercles, or for a little more than one-third; there is also some hair growing over the edge of the sole anterior to this point. The tail is long; the vertebræ about twice as long as the hind foot, though the proportion varies in specimens; it is also rather more than one-third the head and body. It is well covered with stiff appressed hairs, a little longer towards the tip, and at the tip forming a pencil.¹

The prevailing color of the upper parts is a lively uniform rufous or chestnut brown; the color commencing on the crown and passing backwards in a well defined dorsal stripe about the width of the head. The sides and anterior of muzzle are pale brownish gray, with a tinge of yellowish; the color well defined against the dorsal stripe, but passing rather insensibly into the yellowish grayish white of the under parts. The sides of the muzzle are like the belly. There are numerous longer fine hairs interspersed among the fur of the back of a dark reddish brown or clear brown color; but these do not obscure the brighter tints. The feet are grayish white. The tail above mixed grayish and brown; darker and almost black near and at the tip. The under parts are like the belly.

There are slight variations in the color of different specimens, the above description being

¹ The following notes are derived from a specimen in alcohol: This animal is much more like the long-tailed mice in external form than the Arvicolæ. The ears are large and prominent, the membrane thin, and not inflected at its anterior edge. The antitragus is well developed into a valve. The muzzle is quite acute, almost as much as in the mice; the whiskers are full and long. The feet are slender, and not very long; the soles have six tubercles, the posterior inner rather small.

taken from an average winter specimen. There is usually a tendency in the rufous of the back to run down more or less on the sides just anterior to the hind legs. There is frequently, also, a yellowish brown spot in the insertion of the whiskers, sometimes a dusky one instead. A midsummer specimen (864) is of a more vivid rufous, this color tinging the sides of body and head, (but not of the shoulder.) There is a bright fulvous yellow spot on each side the muzzle.

Two specimens of *Arvicola*, borrowed from the cabinet of Professor Agassiz, and labelled "Lake Superior," exhibit a close resemblance to the *A. gapperi*, and, in fact, are scarcely to be distinguished but by the rather larger size and a few other peculiarities. It is possible that they may be from Massachusetts, and labelled by mistake. Were this the case with the present materials only, I would have little hesitation in considering them the same; but if really from Lake Superior, (the north shore,) the remoteness of the two localities, and the difference in their zoological characters, might go far to give a specific value to the otherwise trifling distinctions.

The size is rather less than that of the common *Arvicolae* of the eastern States; the head narrow and rather acute. The ears are large, longer than broad, projecting beyond the fur, and always visible. They are coated with short close hairs on both sides. Antitragus large.

The hind feet are quite large and broad; the sole hairy for nearly half its length from the heel, and involving the first tubercle. The tail is quite thick, tapering but little to the tip, which is terminated by a pencil of hairs, and otherwise well covered; it is considerably longer than the head, and more than one-third as long as the head and body.

The upper parts, from the crown to the rump, are a bright and uniform rufous brown or chestnut, mixed with, but not obscured by, black hairs; the fur is generally soft and glossy. The entire sides of the head and body are a dirty brownish yellow, obscurely mixed with black hairs. The whole head anterior to the eyes is similar, with rather more black hairs. The color of the sides is well defined against that of the back; beneath it passes not very sensibly into the yellowish white of the belly and under parts. The feet are grayish white. The tail above is light brown, becoming darker near and at the tip; beneath it is like the belly; the line of separation very distinct.

The female is similar, but smaller, with a more slender tail.

The specimens are very similar to those received from Mr. Jenks, except that the male has considerably stouter feet and tail. The belly is rather yellower. The size generally is larger. The nose appears to be longer.

$\frac{19.56}{9.10}$ ♂, *Lake Superior*.—The skull of this animal is rather long in proportion to its width, but at the same time considerably depressed. There is a decided indentation or shallow concavity in the forehead just anterior to the parietal bones. The nasal bones and nasal branches of intermaxillary are of equal length, and do not extend back as far as the orbit, reaching, in fact, but little posterior to the anterior base of the zygomatic arch. The contracted interorbital portion of the frontal bones is quite broad, as wide as is the muzzle, (.15 of an inch,) and exhibits a small hole or foramen in the bone on either edge, situated at the beginning of the contraction, and a little anterior to the middle of the longitudinal axis of the skull.

The interparietal bone is somewhat lozenge-shaped, broadly obtuse anteriorly, more rounded behind, on either side extending outwards in an acute angle. The line connecting the extreme lateral points of the bone would cross about or a little behind its centre. The occipital foramen is nearly round. The distance from the line of upper molars to the posterior base of the incisors

is about one-third the distance from the incisors to the occiput. The line of molars is short, only about one-fifth the length of the skull, (.20.)

A rather striking peculiarity of this species and its allies is seen in the construction of the bony palate, which ends sharply like a thin shelf, with a cavity below and behind it, (when the palatal surface is superior,) the shelf with nearly a straight edge. In the other American types there is a step from the palatal surface to a fossa opposite the inner face of the posterior upper molar, from which there is an additional step to the plane of the basi-sphenoid and basi-occipital, the palatal surface ending in an acute angle behind. The incisive foramina are unusually long and open.

The lower jaw is lower than in the large Arvicolae, the coronoid process shorter, not rising to the level of the top of the condyloid, and more erect posteriorly. The descending ramus is longer, narrower, and more horizontal.

The incisors are small, and narrower transversely than antero-posteriorly. The molars are small and narrow. There is little characteristic in the anterior upper one. The middle is composed of one anterior, one interior, and two exterior closed triangles, four in all; the posterior an outer one; instead of five, the posterior an inner one, as in *A. riparius*, &c. The posterior upper molar is longer than the middle one. It is composed of an anterior triangle, two external and one internal, and terminating in a bent crescent-like loop, the back of which is external and nearly straight or slightly concave. There are four salient angles on the inner side, and three on the outer, besides the long nearly straight line of the posterior loop.

In the molars of the lower jaw the outlines of the enamel ridges in the crowns are formed entirely by the indentations of one single outer enveloping sheet of enamel. When these indentations or re-entrant angles meet from opposite sides in the crown, their parietes are distinctly double, instead of fusing into one. There is thus a much less tendency to lateral enclosed triangles, the triangular spaces when indented going usually entirely across the tooth. The posterior molar, as usual, is composed of three triangles, or sub-triangular spaces. The middle molar has two indentations on either side, which meet and divide the crown into three triangles, each extending across the tooth. There are three salient angles on each side, which, like the indentations, do not alternate with each other on opposite sides, but are opposite. The anterior molar has three indentations on the outside, and four inside, with four salient angles outside, and five inside, counting the angular sides of the anterior loop, (which are sometimes quite obsolete.) The dentine of the anterior loop with its angular edges is continuous with that of the succeeding inner salient angle.

In the female skull (1957) the posterior external triangle of the posterior upper molar is not cut off from the posterior loop, but, on account of the shallow indentation behind it, is continuous with the loop. The anterior outer re-entrant angle of the middle lower molar slips a little past the opposite one, so as to form an imperfect lateral triangle on either side, instead of a continuous one completely across. The dentine of the anterior loop of the anterior lower molar is continuous with that of the first external salient angle as well as the internal; indeed, there is a constant tendency to variation in the closeness of approximation of the opposing re-entrant angles, and the consequent number of complete enclosures. The angular outlines of the enamel lines are generally more rounded off. The skulls of specimens from Massachusetts in general agree in all essential respects, allowing for their belonging to younger animals. The inter-orbital portion of the skull is wider, measuring .18 of an inch. The muzzle is shorter and more arched. There is no important difference in the teeth.

The skull bears a very close resemblance to that of *Arvicola rutila*, so close, indeed, that with the limited materials at my command I am unable to indicate reliable characters to separate specimens from Massachusetts and Lapland.

This species exhibits a very close resemblance in many respects to *Arvicola rutila* of Pallas, as shown by a comparison with specimens from Sweden and Kamtschatka. The size, general shape, peculiar pattern of coloration, and characteristics of skull are nearly the same. Both have the rufous back well defined against the lighter sides, the whitish feet and under parts. The ears, however, in *A. rutila* are smaller and more densely covered with short hairs. The hind feet are shorter, scarcely over .65 of an inch; the sole much more densely pilose from the heel, beyond the first tubercles, or for more than half the length; the hairs longer. The most conspicuous distinctive feature, however, in addition to the shorter, more hairy soles, is the shorter tail. The vertebral portion of this is shorter than the head, and not more than half as long again as the hind foot; it is very thick and does not taper till very near the end. It is covered very densely with long, stiff appressed hairs, longer beneath and terminally than above and at the base, and with a rounded pencil at the tip projecting more than one-third the length of the vertebral portion. The American species, on the other hand, has the tail thinner, longer than the head, nearly twice as long as the hind foot; less densely coated with shorter hairs, which are not appreciably longer in the posterior than the anterior half; the terminal pencil in which is shorter.

The species appears quite distinct from the *Hypudaes glareola* of Keyserling and Blasius.

The *Arvicola gapperi* was first described by Gapper in an article on the mammals of the district of Canada between York and Lake Simcoe. He supposed it to be the *A. noveboracensis* of Rafinesque, but Dr. Richardson having pronounced it undescribed, the editors of the Zoological Journal called it after its discoverer. It has not hitherto been indicated as occurring within the limits of the United States, though apparently not rare in eastern Massachusetts.

I am very much inclined to consider the *Arvicola fulva* of Audubon and Bachman as identical with this species.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height.
1359	.....	.....	Halifax, N. S. ....	.....	Jno. Downes	Mounted .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
910 ¹	1956	♂	Lake Superior.....	.....	Prof. Agassiz.....	Skin.....	.....	1.17	3.83	1.42	1.60	.40	.75	1.03	.56	.48	.....
911 ¹	1957	♂	do.....	.....	.....do.....	..do.....	.....	1.08	3.60	1.50	1.75	.40	.70	.99	.52	.50	.....
2530	.....	♂	.....do.....	.....	.....do.....	In alcohol.....	.45	.90	1.10	3.84	1.58	.....	.47	.73	.....	.....	.....
184 ¹	1936	♂	Middleboro' Mass.....	July.....	J. W. P. Jenks	Skin.....	.....	1.00	3.42	1.25	1.50	.40	.70	.93	.50	.48	.....
885 ¹	1937	♂	do.....	do.....	do.....	do.....	.....	1.08	3.25	1.25	1.42	.35	.69	.97	.54	.....	.....
2871	.....	.....	.....do.....	.....	.....do.....	In alcohol.....	.40	.80	1.04	3.22	1.25	1.42	.30	.75	.....	.....	.....
2872	.....	.....	.....do.....	.....	.....do.....	do.....	.40	.75	.98	2.68	1.15	1.27	.28	.70	.....	.....	.....
2873	.....	♂	.....do.....	.....	.....do.....	do.....	.42	.80	1.04	3.18	1.20	1.40	.40	.70	.....	.....	.45
2874	.....	♂	.....do.....	.....	.....do.....	do.....	.48	.85	1.16	3.50	1.56	1.78	.35	.72	.....	.....	.....
2875	.....	♂	.....do.....	.....	.....do.....	do.....	.46	.85	1.03	3.13	1.33	1.58	.40	.72	.....	.....	.....

¹ Measured before skinning.

ARVICOLA RIPARIA, Ord.

Meadow Mouse.

Arvicola riparius, ORD, J. A. N. Sc., Phila. IV, II, 1825, 305.

AUD. & BACH. N. Am. Quad. III, 1854, 302.

Arvicola palustris, HARL. F. Am. 1825, 136.

Arvicola pennsylvanica, (ORD,) AUD. & BACH. N. Am. Quad. I, 1849, 341; pl. xlv.

?? *Arvicola riparius*. Kennicott, Agri. Rep. U. S. Patent Office for 1856, (1857,) 104; pl. xiii. (*longipiliis*.)

SP. CH.—Size large. Head and body measuring $4\frac{1}{2}$ inches. Tail more than one-third this length. Feet very large, scaly. Hair rather short. Above, dark brown, varied with reddish or yellowish brown; beneath, pure ashy plumbeous; tail and feet dusky, the former scarcely lighter beneath.

As I have not yet satisfied myself of the precise limits within which this animal may vary, and how far the numerous species described by authors are worthy of retention, I have concluded to give a minutely detailed description from a specimen so near in locality and appearance to the original *A. riparia* as to serve as a suitable standard of comparison. I have accordingly selected a fresh specimen caught at Carlisle, Pennsylvania, in September, and agreeing exactly with one from Philadelphia, presented by Major Leconte as the type of *A. riparia*.

Fresh specimen from Carlisle, Pennsylvania.—Body broad and stout. Head considerably pointed; the muzzle projecting .15 beyond the upper incisors. The upper lip is bifid to near the nose, to which there extends a shallow naked groove, continued across the nose, separating the two nostrils, which are slightly swollen around their aperture. The extreme tip of the nose is thus naked, the hair, however, so far forward that this naked tip cannot be seen when viewed from above. The eye is small, about .15 an inch in longitudinal axis; its centre midway between the nose and the ear. The ears are almost orbicular, nearly as broad as long; the antitragus much developed, almost semicircular; the chord of its arc .2 long; its surfaces are thinly covered with long hairs, which project beyond the margin, but do not obscure it.

The thumb of the fore foot is obsolete, the corresponding claw springing directly from the skin; this is well shaped, and similar to the others, but not so large and blunt at the point. The third and fourth fingers are about equal; the second claw reaches the end of the third finger; the fifth claw reaches the end of the second finger. The sole of the hind foot is sparsely hairy from the heel to the tubercles. The central three toes are longest; the fourth longest of all; the first and fifth are inserted on shorter metatarsals than the central ones; the claw of the first extends to the cleft between the second and third; the fifth toe (exclusive of claw) reaches the cleft between the third and fourth.

The tail is about four-ninths the length of head and body; it is subquadrangular, tapering, and sparsely covered with stiff hairs, which do not conceal the annuli; there is a scanty pencil of hairs at tip.

Teats, four inguinal, and four pectoral.

The prevailing color of the back and sides is a reddish brown, the shade of reddish distinctly appreciable, the hairs being broadly marked subterminally with this color. They are tipped with black, which, with the intermixture of black hairs, causes a strong shade of dusky, uniformly diffused. The lower parts of the sides are rather purer yellowish brown; the belly whitish ashy, tinged with plumbeous, and the faintest possible shade of brown. The feet and tail are dusky, the latter scarcely paler beneath.

Measurements.

	Inches.
Nose to occiput.....	1.40
eye	.55
ear.....	1.16
root of tail.....	4.40
end of outstretched hind legs.....	5.90
Tail from root to end of vertebræ.....	1.75
hairs.....	2.00
From long hairs of back to end of vertebræ.....	1.45
Ears, height, posteriorly.....	
anteriorly	.55
internally above skull.....	.35
width	.42
Arm.....	
length of fore arm.....	.66
from elbow to end of claws.....	1.15
forefoot to end of claws.....	.45
longest toe and claw.....	.27
longest claw.....	.10
Leg, from knee joint to end of claws.....	1.56
tibia.....	.90
hind foot from heel to end of claws.....	.80
longest toe and claw.....	.32
longest claw.....	.11

In giving an account of the skull, I have selected that belonging to the specimen of Major Leconte, above referred to, as perhaps serving better for the purpose I have in view than that of the animal just described.

The skull in this specimen ($\frac{1\frac{7}{8} \times 1\frac{5}{2}$) is unusually long and narrow; its width, $50\frac{1}{2}$ hundredths its length, or barely over half. The molars are about 23 hundredths of the total length; the measurement being: Length of skull, 1.18 inch; width .60; length of molars, .28. The occipital foramen is rather broader than high. The cranium projects antero-externally into the interzygomatic cavity as a well defined obtuse angle. The interparietal bone is long, and is truncated on the outer sides, sending out a point to the backward prolongation of the temporal bone.

The upper incisors are broad; their cutting edges, taken together, about as long as the crown of the anterior upper molar. The anterior surface broad, convex, although, as usual, there is a very shallow concavity towards the outer edge. The last molar is a little longer than the middle one. It has three vertical groves on each side. There are three salient angles on the outside, besides the C-shaped loop which succeeds those as a long curve, convex externally, and passing round to the inner side of the tooth. Here there are three salient angles; or four, including the end of the C; in fact, the two ends of this curved loop constitute two of the four inner salient angles. There are in all five islands of dentine, completely enclosed by loops of enamel; one anterior, one posterior, one internal, and two external; all are triangular except the posterior, which is curved as described.

very much better than to *A. riparia*, in which not one of these characters exists, the differences being in color, length of tail, and position of teats. Thus, the tail of *riparia* is fully twice the proportional length indicated, the color is much darker, and there are two pairs of pectoral teats, in addition to the inguinal ones. Even if *A. pinetorum* be out of the question, there is another species in Pennsylvania, which I do not now describe, of redder color and shorter tail than *riparia*, and of nearly the same size. I feel, therefore, fully justified, in view of the uncertainties of the case, in preserving the name of *riparia*.

ARVICOLA BREWERI, Baird.

Gray Mouse.

SP. CH.—Size large. Feet very broad and stout; soles with six tubercles. Fur coarse. Ears small. Above, pale grayish yellow brown; beneath, with the under surface of the tail and the upper surfaces of the feet strongly hoary or ashy white, with a tinge of yellow.

This species is among the largest of those found in the eastern United States, in fact considerably exceeding any I have ever seen from within this limit. The head is very broad, the upper outline much curved; the ear only moderately large, orbicular, the antitragus much developed, the auricle well covered with hairs on both sides.

The feet are broad and stout, the hind claws longest; the thumb is armed with a short but pointed and curved claw, rather larger, apparently, than in some other species. There are six tubercles on the soles, the posterior inner large, the posterior outer quite small and inconspicuous.

The prevailing color of this species above is a yellowish gray, or grayish yellow brown; quite different in its pallid tint from any other American species I know of. The entire under parts are of quite a pure yellowish white, this color extending nearly half way up the sides. The under part of the tail is similar, imparting to it a strongly bicolor appearance; the upper surfaces of the feet are also white, with perhaps a faint tinge of plumbeous.

The skull is strictly that of section A, but presents some peculiarities in the narrow dimensions behind the zygomatic arch, and other features. The most prominent among these is in the shape of the interparietal bone, which is longer than usual, and laterally sends out on either side a long point, the axes of which are in the same straight line, and but little behind the middle of the bone. In most of the other species this bone is truncate laterally, without the long point.

This species differs decidedly from any other I know in the pallid tints above and the white of the under part, where the hairs are white for nearly half their length. The fur is very coarse, and not compact; much like that of *Sigmodon*.

The only specimens of this species I have ever seen were collected by Dr. Brewer, on the island of Muskeget, on the eastern coast of Massachusetts, where they are said to be abundant.

List of specimens.

Catalogue number.	Corresp'ing No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.									
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.
2828	....	♂	Muskeget Island, Mass.	July, 1856	Dr. T. M. Brewer.	In alco...	.57	1.12	1.37	4.60	1.77	2.07	.42	.88	.....	.....
2829	....	♂	.....	.....	.....	do.....	.55	1.10	1.31	4.42	1.56	1.81	.41	.90	.....	.....
2830	3213	♂	.....	.....	.....	Skin.....	.56	1.08	1.35	4.30	1.65	1.94	.....	.85	1.11	.65
2831	3214	♂	.....	.....	.....	do.....	.59	1.18	1.40	4.67	1.84	2.24	.45	.90	1.22	.69
2832	3215	♂	.....	.....	.....	do.....	.40	.81	1.04	3.00	1.28	1.48	.38	.80	.....	.....
2833	...	...	.....	.....	.....	In alco...	.40	.86	1.08	3.10	1.31	1.54	.40	.81	.....	.....

ARVICOLA RUFIDORSUM, Baird.

SP. CH.—Size large. Above, bright rufous, or reddish chestnut; this tint paling very insensibly to the belly, where it changes rather abruptly to reddish white. No dorsal band. Feet reddish. Under surface of tail whitish.

This species is of large size, nearly equal, indeed, to the *A. riparius*. There are no very prominent peculiarities in form; the ears being moderately large, well furred, and concealed by the hair of the head. The feet are large and broad; the soles with six tubercles; the posterior rather longer than usual.

The upper parts and sides are a bright chestnut red, slightly obscured by dusky tips to the hairs, although these are only visible on close examination. The under parts of body and tail are white, tinged with dull yellowish; the feet are reddish.

This species, in its bright colors, resembles no other found in the eastern portion of the continent, except, perhaps, *A. pinetorum*. This, however, belongs to a different section, with much shorter head, tail, and feet. From *A. gapperi*, the uniform red of the back and sides will at once distinguish it. It comes much nearest to *A. occidentalis*, but is larger; has the red more vivid, and has no trace of the darker broad dorsal band. The tail, also, is shorter.

The only specimen of this species I have ever seen was obtained at Holmes' Hole, Massachusetts, and belongs to the Boston Society of Natural History.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.					
					Tip of nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Hind foot, length of.	Skull, length.	Skull, width.
901	1946	Holmes' Hole, Mass.	Boston Soc. N. H. (borrowed.)	Skin.....	4.20	1.55	1.85	.82	1.11	.62

ARVICOLA TOWNSENDII, Bachman.

Oregon Ground Mouse.

Arvicola townsendii, BACHMAN, J. A. N. Sc., Phila. VIII, 1, 1839, 60.—IB. In Townsend's Narrative, 1830, 315.

WAGNER, Wiegmann's Archiv, 1843, II, 53.

AUD. & BACH., N. Am. Quad. III, 1853, 209; pl. cxliv, fig. 1.

SP. CH.—Very large, (head and body $5\frac{1}{2}$ inches.) Ears large; two-thirds as long as hind foot; well furred. Tail, including the hairs, rather less than half the head and body; the tail vertebræ twice the length of hind foot. Thumb claw conspicuous. Toes long; one-third the whole foot. Fur measuring a little over one-third of an inch, with a slight gloss. Above, dark fuscous brown, with but little yellowish brown visible. Sides paler; beneath, ashy white. Tail almost uniformly brown throughout. Feet liver brown. Skull, $1.27 + 71$, or as $100 : 56$.

This species is one of the largest of its genus in North America, perhaps the largest of those occurring in the United States, though less than the *Arvicola amphibia* of Europe. The head is broad and blunt; the whiskers are as long as the head; some black, the others light gray. The ears are quite unusually large and broad; .62 of an inch, or nearly two-thirds as long as the hind foot, (1.02 inches.) They are well covered with hair on both surfaces, except around the meatus, and project about an eighth of an inch beyond the fur when laid back flat.

The feet are large; the anterior, measured from the carpal joint, as long as the ear, (.62 of an inch.) The thumb is short, and armed with a small claw with the point worn off; the third claw is longest, the fourth a little shorter; the second claw reaches a little beyond the base of the third; the fifth is shorter than the second. The hind foot is about half as long as the tail vertebræ; the sole is hairy from the heel to the tubercles; the toes are long; the middle one equalling half the rest of the foot. The first claw reaches to the notch between the second and third toes; the third toe is a little longer than the second and fourth; the fifth claw scarcely reaches the base of the fourth.

The tail is long; with the hair, it is a little less than half the head and body in the dried skin. It is covered with short stiff appressed hairs of nearly equal length throughout, and terminated at tip by a scanty pencil. The hairs on the body are rather coarse, and measure a little over one-third of an inch above. There is a slight gloss to the fur.

There is nothing in the coloring of this species which distinguishes it specially from others of the genus in the east; the prevailing color above being a yellowish rusty brown, so much overlaid with black hairs as more or less to conceal it, especially along the back. The sides are paler, with much less black. The cheeks are a shade brighter than the sides. The under parts are dirty ashy white, with a very obscure wash of light brownish. The feet are pale liver brown. The tail is dark brown above, passing insensibly into a little paler shade beneath. There is a dusky tinge on the side of the nose, and the edges of the lips are white. One specimen (1382) has the under parts tinged with a very pale dirty yellowish brown.

A skull of this species ($1\frac{5.9.5}{4.6.4}$) is larger than that of any North American species with which I am acquainted, measuring 1.27 inches by .71, and .4 from the molars to the incisors. The occipital foramen is higher than broad, with a distinct emargination above. The middle upper molar has but four triangles, the posterior having merely an inner heel, giving it a quadrilateral shape. The posterior upper molar is composed of one complete triangle anteriorly, one interior, and two exterior. The posterior portion is composed of a closed crescent, with the convexity exterior, and a spur on the inner face. The posterior loop of the crescent, however, is not an internal salient angle, but a posterior; its inner side, however, is concave. There

are thus three exterior salient angles besides the long curve, and four interior besides the posterior rounded point. The anterior lower molar exhibits four salient angles on each side, and an angular lobe which almost presents a fifth external salient angle. There is one posterior closed triangle, three exterior, and three interior. The anterior lobe is connected with the adjacent interior salient angle, but not the exterior. The middle molar is scarcely narrower than the anterior.

The skin 1275, from Crater Pass, differs in having the upper parts more dusky, and the line of separation between the colors of the sides and belly more distinct. There is also a distinct light tinge along the sides just above this line. The skull varies a little in having a simple crescent at the posterior extremity of the last upper molar, and only two external triangles in the anterior lower molar ; the trefoil having both lateral lobes.

No. 1270, from the Upper Des Chutes, approaches near 1275, but is too young to determine with accuracy. I have preferred referring it to *A. montana*.

This species was first described by Bachman from specimens brought from Oregon by Townsend. I am unable to speak of its relationships to the large *Arvicola* from the British territory, described by Richardson.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—
								Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Longest toe.	Height of ear.	Length of skull.	Width of skull.	
464 ¹	1595	....	Shoalwater bay	1854	Gov. I. I. Stevens...	....	Skin.	5.50	2.00	2.25	.62	1.02	.34	.62	1.27	.71	Dr. J. G. Cooper.
580	....	....	.....do.	Sept. 1854..	Dr. J. G. Cooper....	19	do.	5.00	2.00	2.25	.60	1.02	.33	.60	....	....	.....
1382 ²	....	♀	.....do.	Aug. 1855..	do. ....	....	do.	5.00	2.00	2.20	.59	1.00	.32	.60	....	....	.....
2396	....	....	Puget's Sound.	1856	Dr. G. Suckley. ...	....	do.	6.00	....	2.00	....	....	....	....	....	....	.....
1275	3235	....	Crater Pass, Cascade Moun- tains.	1855	Lt. R. S. Williamson	....	do.	5.25	1.75	2.00	.60	1.01	.35	.60	1.18	.68	Dr. J. S. New- bery.

¹ When fresh this specimen measured 7½ inches with the tail ; the ear ¾ of an inch in length by ½ an inch in breadth. The iris was black.
² When fresh this specimen measured to root of tail 5.50 inches ; tail, 2.50 ; hind foot, 1.00 ; fore foot, .50 ; (?) ears, .50.

ARVICOLA MONTANA, Peale.

Arvicola montana, PEALE, Mamm. & Birds of U. S. Ex. Ex. 1848, 44.
AUD. & BACH. N. Am. Quad. III, 1854, 302.

SP. CH.—Size of *A. riparia*, or a little less, (4.75 inches.) Fur about half an inch long. Ears short, as long as fore foot, about half the hinder ; sparsely coated with longish hairs. Feet short ; hinder ones .80 of an inch. Tail long ; about two-fifths of the head and body ; vertebrae more than twice as long as the hind foot.

Above, dull yellowish brown, uniformly and equally mixed with black ; lighter on the sides ; beneath, dull whitish ash. No rusty tints. Tail distinctly bicolor.

Skull, 1.12 + .62, or as 100 : 56. Distance between upper molars and incisors less than one-third the whole length of the skull

1269. This species is about the size of the largest of the *Arvicola* found in the Atlantic States, but is considerably less than the *A. townsendii*. The body is stout and full ; the hair rather

loose and not compact, quite bristly and coarse, with little lustre. The hairs on the back measure about half an inch; those beneath, half as much. The ears are short, and probably concealed in the fur in fresh specimens; they measure but little over half the length of the hind foot, (about .4 of an inch,) but about equal the fore foot from wrist; they are sparsely covered with rather long hair on both surfaces, except around the meatus. There is a segmental antitragus of moderate size.

The hind feet are rather short, (.8 of an inch,) about twice as long as the fore foot. The toes are rather short, about one-third the whole foot. The thumb is armed with a small blunt claw.

The tail is moderately long, rather more than two-fifths the head and body in the dried skin; it is closely covered with appressed stiff hairs of equal length, and terminates in a scanty pencil.

The prevailing color above is a dull yellowish brown, pretty uniformly mixed with black, and rather lighter on the sides. There is nowhere any rusty tinge. Beneath, the color is a dull whitish ash, mixed with the plumbeous of the base of the fur. The feet are brownish white. The tail is brown above; dirty white beneath, with a moderately distinct line of demarcation.

The skull of this species is broad and short, 1.12×62 , or as 100 : 56. The distance from the molars to the base of the incisors is about one-third the distance from incisors to occiput, (.35.) The line of molars measures .24. The posterior upper molar has three external salient angles in addition to the rounded crescentic lobe, which is simple, or without a supplementary lobe on the inner side, springing from the concavity. The anterior lower molar has one posterior closed triangle, three interior, and two exterior, with a trefoil lobe anteriorly, the lateral divisions of which each add a salient angle, making five interior and four exterior. The anterior and middle molars are nearly of equal width.

This species is most nearly allied to *Arvicola edax*, resembling it in size and color. The feet and ears, however, are much smaller, as will be seen by the table of measurements. From *A. townsendii* its grayer colors, smaller size, smaller ears and feet, &c., will at once distinguish it.

It is with very considerable hesitation that I refer No. 370, from Monterey, to this species. It comes very near *A. edax* in color, but agrees much more closely with the present in the short feet and ears. The line of separation between the upper and under colors of the tail is much more strongly defined. The feet are dirty white. The principal ground for suspicion as to the identity of the two species is based on the striking dissimilarity in the skulls. The proportions of breadth to length in $\frac{1.284}{370}$ are 1.03 to .61, or 100 : 60 nearly, quite an unusual proportion in this group. The distance from upper molars to base of incisors (.30) is not quite one-third that from incisors to occiput; the crowns of the upper molars measure .25, or about one-fourth the total length of the skull. The anterior lower molar differs widely in having an additional lobe to the anterior trefoil on the inner side. There is one posterior closed triangle, three interior, and two exterior, as usual; the anterior lobe, however, is not a simple trefoil open loop, as in the other species, but its anterior branch, instead of rounding off antero-internally, has a salient angle there, giving rise to six of such angles on the inside of this tooth and five on the outside, the anterior of the latter rounded, however, leaving but four very sharp angles.

As, however, the teeth and skull often vary considerably in the same species, I do not feel at liberty to regard this specimen as distinct without further materials, although its locality is widely remote from that of the rest. Should future examinations substantiate the species, I would propose for it the name of *A. trowbridgii*, from its accomplished discoverer and collector, Lieutenant Trowbridge.

The description of *A. montana*, given by Mr. Peale, is too short to describe fully its characters, and omits to mention some of most importance. As far as it goes, however, it agrees pretty well with the animals collected by Dr. Newberry, and, as both gentlemen gathered their specimens in much the same region, I have given them the same name. Mr. Peale obtained his near Mount Shasta, as he informs me. Several specimens belonging to Lieut. Bryan's collection, from the upper waters of the Platte, though differing in some slight points, I refer to this species, rather than to make a new one.

List of specimens.

Catalogue number.	Corresp't No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.												Collected by—
								Nose to eye†	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height.	Longest toe.	
1263	2219	♂	Upper Des Chutes, O. T.	1855.....	Lt. R. S. Williamson.	...	Mount'd	...	...	...	3.50	1.33	1.53	.36	.77	...	...	.42	.25	Dr. Newberry.
1370	2221	♂	do.....	1855.....	do.....	...	do...	...	...	...	...	...	...	...	...	...	...	...	...	do
1269	2222	♂	Upper Klamath Lake	1855.....	do.....	...	do...	...	...	...	4.75	1.80	2.00	.40	.79	1.12	.62	.44	.27	do
1271	2223	...	Lost River, Cal.....	1855.....	do.....	...	do...	...	...	...	4.50	1.55	1.70	.37	.81	...	...	.40	.23	do
? 2534	3219	...	Petaluma, Cal.....	1855.....	E. Samuels.....	...	Skin	.55	1.38	...	1.76	...	...	.42	.80	1.16	.70	...	...	...
? 370	1284	...	Monterey, Cal.....	.....	Lt. Trowbridge.....	...	Mount'd	...	...	...	4.00	1.40	1.50	.39	.74	...	...	.44	.24	...
??1907	2607	...	Pass Creek, Neb.....	Aug. 10, 1856	Lt. F. T. Bryan...	243	Skin	...	...	1.25	5.00	1.75	2.00	...	...	...	...	...	...	W. S. Wood.
??1926	3218	...	Medicine Bow Creek, Nebraska.	Aug. 26, 1856	do.....	307	do...	.45	.90	1.10	3.28	1.20	...	.40	.73	...	...	...	...	do
??1925	...	...	do.....	do.....	do.....	309	In alc..	.40	.80	1.10	3.20	1.19	...	.37	.70	...	...	...	...	do
??1924	...	...	do.....	do.....	do.....	...	do...	.45	.88	1.15	3.10	1.25	...	.38	.72	...	...	...	...	do
??1923	...	...	Laramie river, Neb..	Aug. 5, 1856	do.....	201	do...	.57	1.20	1.40	...	...	...	.45	.80	...	...	...	...	do

¹ Measured before skinning.

ARVICOLA LONGIROSTRIS, Baird.

SP. CH.—Size large, (4½ inches.) Skull, 1.08 inch. Fur long, .55 of an inch above. Ears rather small, three-fourths the length of hind foot, sparsely coated with short hairs. Feet very short; hinder ones less than three-quarters of an inch long. Tail ¾ the body, the vertebræ twice as long as the hind foot.

Above dull yellowish chestnut, or rufous brown, mixed with black, yet without any distinct rusty. Beneath dirty whitish ash. Line separating the colors rather distinct. Feet light brown. Tail nearly unicolor, paler beneath at the base.

Skull 1.08 × .61, or as 100 to .55. Muzzle of skull very long. Distance between upper molars and incisors more than one-third the whole length of the skull.

(^{1 2 6 8}/_{2 2 2 0} ♀.) This specimen is indicative of a large and stoutly built animal, nearly equal to the largest eastern species. The whiskers are not as long as the head, and mostly of a light gray color; a few black ones are interspersed. The hair is rather loose and coarse, with but little lustre; this may, however, be owing to immersion in alcohol. The hairs on the back measure about .55 of an inch in length and about half as much on the belly.

The ears are rather small, almost as broad as long, or nearly orbicular, and about three-fourths the length of the hind foot, or longer than the fore foot; they are thin and coated on both sides with rather sparse and short hairs. The antitragus is not large. The feet are quite unusually short for members of this group, the hind foot measuring less than 75-100ths of an

inch. The tail, in the dried specimen, is about two-fifths the length of the body; it is well covered with hair and has a scanty pencil at the tip.

The upper parts in this species are of a dark dull yellowish chestnut, or rufous brown, mixed with black; no indication of rusty, however. The under parts are dirty whitish ash. The feet are light brown; the tail brown; slightly paler at the base beneath. The line of separation between the colors of the sides and belly is rather distinct.

Skull.—The skull belonging to skin 1268 has some striking peculiarities, which distinguish it from others with which it has been compared. It measures 1.08 inch by .61 (100:55.) The most prominent feature is the length of the skull anterior to the molars. Thus the distance from the molars to the base of the incisors (.37) is considerably more than one-third that from the incisors to occiput, or even rather more than one-third the length of the entire skull. The molars are thus thrown further back than in other species. The line of upper molars measures .24 of an inch, or less than one-fourth the length of the skull.

The posterior upper molar has three exterior salient angles besides the posterior bent crescentic lobe, which is without any supplementary loop on its inner side. On the inside there are three salient angles, in addition to that of the posterior branch of the loop, or one anterior triangle, two exterior, one interior, and a posterior crescent, with two loops, both pointing to the inner side of the tooth. The anterior lower molar has one posterior triangle, three internal, two external, and an anterior trefoil lobe, the lateral loops of which are somewhat reduced.

This species differs from *A. townsendii* in the smaller size and the proportionally less feet and ears, while it approximates to it in color. From *A. edax* its color and the smaller feet and ears will distinguish it. It is of a darker and more rufous color than *A. edax* and *montana*,(?) while its wider head and longer muzzle separate it from the latter, which it otherwise resembles in the small feet and ears. The feet are still smaller, however, than in the *A. montana*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.									Collected by—
						Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height.	Longest toe.	
1268	2320	♂	Upper Pit River, Cal. . .	Lt. R. S. Williamson	Mounted.	4.50	1.50	1.60	.40	.73	1.08	.61	.45	.26	Dr. Newberry.

ARVICOLA EDAX, Leconte.

California Ground Mouse.

Arvicola edax, LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 405.

AUD. & BACH. N. Am. Quad. III, 1854, 270; pl. cliv, fig. 2.

SP. CH.—Size moderate (head and body four inches;) less than *A. riparia*. Ears large, longer than the fore feet; as long as hind feet, minus the toes; well furred. Tail about two-fifths of head and body, little over one and a half times as long as hind foot. Hind foot .9 inch; toes long. Color above, pale dull yellowish brown, without any rufous; uniformly sprinkled with black. Beneath grayish white. Tail strongly bicolor. Feet grayish white.

The fur of this species is loose and harsh, not lying compactly, and without gloss. The hairs

are rather long, those on the back measuring about four-tenths of an inch, those on the belly about half as much. The whiskers are mostly whitish gray, the upper shorter ones are black. The ears are large and broad, measuring as much as the hind foot, exclusive of the toes, or .55, and exceeding the fore foot. The tail is well covered with short hair, which does not quite conceal the scales; it measures about two-fifths the length of the dried skin.

The fur at base is a dull lead color, not so dark as in many species. The upper parts are a dull pale yellowish brown, without any rufous tinge whatever, and only thinly mixed with black, distributed uniformly over the upper parts, and not concentrated along the back. The sides are rather lighter. Beneath the fur is tipped with dirty grayish white. The feet are brownish white; the tail brown above and at the tip, dull white beneath; the line of demarcation very well defined.

The incisors of this species are orange yellow; the upper ones have an obsolete groove along the inner edge of their faces.

The preceding description is taken from a specimen collected in California, somewhere south of San Francisco, by Dr. J. L. Leconte, and is the original of the species as described by Major Leconte.

This species differs from the *A. townsendii* in its smaller size, grayer color, smaller fore feet, &c.

I am not perfectly sure that it will not be necessary to unite *A. montana* and *edax*, although the difference in the ears is quite appreciable. The *edax* seems to be confined to southern California, while *montana* is more boreal. In alcoholic specimens from San Diego, the tubercles of the soles are large; the soles themselves densely hairy from the heel to the first tubercle.

List of specimens.

Catalogue number.	Corresp'g Na. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.											
					Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.	Length of skull.	Width of skull.	Height of ear.	Longest toe.
.....	.....	California, S. of S. Fr.	Maj. Leconte	Skin ....	.....	.....	.....	4.00	1.25	1.60	.50	.90	.....	.....	.55	.33
2525	.....	Monterey, Cal.	A. S. Taylor.....	In alc ...	.52	1.09	1.30	4.15	1.90	.....	.40	.80	.....	.....	.....	.....
2524 ¹	3215	 do	 do	Skin	.58	1.27	1.40	4.52	2.00	.....	.46	.83	1.16	.....	.....	.....
2526	.....	San Diego, Cal.	Dr. J. F. Hammond.	In alc ...	.52	1.10	1.30	4.30	1.80	.....	.45	.81	.....	.....	.....	.....
2527	3217	 do	 do	Skin	.45	.99	1.20	3.40	1.58	.....	.40	.80	.....	.....	.....	.....
?2528	3216	 do	 do	In alc ...	.52	1.10	1.40	4.40	1.90	.....	.50	.88	1.19	.66	.....	.....

¹ Measured before skinning.

ARVICOLA CALIFORNICA, Peale.

Arvicola Californica, PEALE, Mamm. & Birds, U. S. Ex. Ex. 1848, 46.

LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 408.

AUD. & BACH. N. Am. Quad. III, 1854, 293.

SP. CH.—About the size of *A. riparia* or little less. Fur very long and soft (.6 of an inch.) Ears moderate, five-eighths the length of hind foot, which is .8; well furred. Fore feet half as long as hinder. Tail twice as long as hind feet, more than one-third the head and body.

Above lustrous and distinct light yellowish brown, obscurely mixed with black; sides paler;

belly grayish white, the colors passing quite insensibly into each other. Tail bicolor, upper and lower surfaces not distinctly separated. Skull, 1.14 by .65, or 100 : 57.

This animal in size nearly equals the larger species of the Atlantic States, and is provided with soft and unusually long fur, measuring nearly six-tenths of an inch above. The whiskers are as long as the head, and grayish white in color. The ears are rather large, and scarcely concealed beneath the fur, about five-eighths as long as the hind foot; they are well covered with long hairs on both sides, except about the meatus, and have a distinct segmental anti-tragus. The feet are broad and stout, the hinder rather short, the anterior a little more than half as long as the posterior. The thumb of the hand is obsolete, and its place indicated by a blunt claw. The tail is moderate, about twice as long as the hind feet, tapering considerably, and uniformly coated with appressed hairs to the pencilled tip.

The prevailing color above is lustrous, light yellowish brown, varied with the black or dark rufous brown points of the longer hairs. These do not obscure the ground color much, however, leaving the general tint a yellow brown or brownish reddish yellow. The sides are rather paler. The under parts are grayish white with a yellow tinge, due, perhaps, to alcohol. The feet above are brownish gray; the tail is dark brown above, passing insensibly into a paler beneath. The feet and tail have a rufous tinge, in addition to the colors described.

Skull.—The skull of this species is large and broad; the width about 57 hundredths of the length. The muzzle is long in proportion, and the narrow interorbital portion of the frontal bone widens out behind at a point about midway between the end of the nose and the occiput, instead of being considerably forward of this point, as in *A. occidentalis*. The anterior extremity of the upper molars is distant from the posterior face of the incisors one-third the distance from the incisors to the occiput.

The posterior upper molar has one anterior triangle, two exterior and one interior, besides the posterior bent crescent. This sends out a short lobe outwards near its posterior portion or bend, a character rarely observed in American *Arvicolae*. We have thus, instead of three external salient angles with a rounded space behind them, this last mentioned space indented by a shallow furrow, so as to produce two short, blunt salient angles, making five external in all. The anterior upper molar has one posterior triangle, three interior, two exterior, and an anterior tri-lobed trefoil, the lateral exterior lobe of which is produced backwards to form nearly as decided a salient angle as the three behind it. There are thus four external salient angles and five internal, besides the sub-angular anterior loop of the trefoil.

Measurements.

	Inches.
Head and body (dried).....	4.00
Tail, (vertebræ).....	1.50
Tail, with hairs.....	1.65
Hind feet, from heel.....	.80
Longest toe.....	.40
Fore foot, from wrist.....	.50
Ear.....	.50
Length of skull.....	1.14
Width.....	.65
Proportions of skull...100 : .57.	

The specimen described was collected by Mr. Peale in California, and is the original of the species as presented in the Report on the Mammals and Birds gathered by the United States Exploring Expedition under Captain Wilkes.

This species and *A. occidentalis* differ in their decided clear and bright rufous tinge from any others I have yet seen from the Pacific coast. Indeed, there are none belonging to their division among *Arvicolae* which resemble them among eastern specimens, except one from Holmes' Hole, Massachusetts, already described on page 526.

From its ally, *A. occidentalis*, the *A. californica* differs in being larger, with shorter tail and feet, and longer ears. The fur is longer. The color above is more yellowish and more interrupted by the dark tips of the longer hairs, and the tints of the back, sides, and belly pass much more insensibly into each other. Indeed, there is but little difference appreciable between the back and sides in this respect.

ARVICOLA OCCIDENTALIS, Peale.

Arvicola occidentalis, PEALE, Mamm. and Birds, U. S. Ex. Ex., 1848, 45.

LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 408.

AUD. & BACH., N. Am. Quad. III, 1854, 294.

SP. CH.—Size rather small. Length $3\frac{1}{2}$ inches; tail half this length or more; nearly twice as long as the head. Ears short concealed, less than half the hind feet, well furred. Feet large; anterior half the posterior. Hind toes two-fifths the rest of the foot. Fur soft, short, .35 of an inch.

Above, uniform bright rufous, paler on sides, grayish white, tinged with yellow beneath; colors not distinctly separated. No appreciable mixture of black hairs above. Skull, $1.12 \times .62$, or as 100 : 55.

The fur of this species is soft and fine, with considerable lustre; it measures about 35 hundredths of an inch on the back and half as much beneath. The whiskers are light gray and black, shorter than the head. The ears are short and rounded, concealed by the fur which projects an eighth of an inch or more beyond them; they are a little less than half the length of the hind foot, coated on both sides with rather short hairs which are more closely implanted than in many species; the region around the meatus, however, is bare. The antitragus is moderate.

The feet are quite large; the anterior, measured from carpal joints, are about half as long as the posterior. There is a short, rather obtuse claw to the thumb. The hind feet are hairy beneath from the heel to the tubercles; the toes are rather short; the longest scarcely reaching $\frac{2}{3}$ th the length of the tarsus and metatarsus. The tail is large, nearly twice as long as the head; thick and tapering, uniformly coated with hair of equal length to the tip, which is terminated by a pencil.

The predominant color of this species is a rather bright and uniform rusty along the back and cheeks, paler and more yellowish on the sides; grayish white, with a tinge of yellow beneath, the line of demarkation not distinctly defined. There are the usual long hairs interspersed among the shorter ones on the back; these, however, are tipped with very dark rufous instead of black, and to them the darker color of the back is mainly owing. The feet above are sparsely covered with rufous hairs; the tail is also rufous; passing insensibly beneath with a slightly paler tint.

Measurements.

	Inches.
Head and body, (dried)-----	3. 50
Tail vertebrae-----	2. 00
with hairs-----	2. 20
Hind feet, from heel-----	. 90
Longest toe-----	. 27
Fore foot-----	. 45
Ear-----	. 41
Skull, length-----	1. 12
width-----	. 62
Proportions of skull-----	100 to 55.

Skull.—The skull of this species has rather a short muzzle, and a long cranial portion which, when it is narrowed into the interorbital space, is anterior to the middle point of the skull. The distance from the upper molars to the posterior face of the incisors is one-third that from the incisors to occiput. The posterior upper molar has a supplementary internal lobe projecting from the inner edge of the posterior bent crescent, making five internal salient angles, and three external, besides the posterior rounded space. The anterior lower molar has one posterior triangle, three external and three internal, besides the anterior trefoil, the external lobe of which is thus converted into a triangle; in this trefoil, again, the indentations between the anterior loop and the lateral on either side come so close to each other as very nearly to isolate the anterior loop from the inner lateral, and add a fourth internal triangle. There are five well developed salient angles internally, and five externally, the fifth formed by the anterior loop of the trefoil, the inner side of which almost produces a sixth internal angle.

The specimen described above was collected by Mr. Peale on Puget's Sound, and is the original of the species, as established in his report of the Mammals and Birds of the United States Exploring Expedition under Captain Wilkes.

ARVICOLA MODESTA, Baird.

SP. CH.—Size of *A. pinetorum*, or larger. Ears moderate, well furred, rather shorter than the large fore feet, (.35 to .40). Tail vertebrae scarcely longer than the head, (.9); with the hairs, one-third the head and body. Fur long, soft, .4 of an inch.

Above, almost black, hairs with faint yellowish brown tip. Beneath, hoary plumbeous, the line of separation not very distinct. Tail like the corresponding regions of the body. Feet dark brown.

Middle upper molar with five triangles, although the indentations between the two last do not quite meet.

Although the specimen collected of this *Arvicola* is not quite grown, the skull shows that it would not attain to much greater size, and that it consequently is among the smaller of the American species. The whiskers are nearly as long as the head. The ears are entirely concealed beneath the fur, although they are quite large, .35 of an inch long, and about as broad, with well developed antitragus; they are covered quite densely with long hair on both sides. The hind feet are somewhat mutilated, so that it is difficult to determine their exact proportions, but they appear short in proportion to the fore feet. These, indeed, seem unusually long, measuring .4 of an inch, as far as can be made out; the longest finger, .22. The estimated

length of the hind feet is a little less than .7; the longest toe, .23; the tail is about an inch long, well covered with hair. The fur is long and loose, the under hair measuring .4 of an inch. Much longer hairs are thickly interspersed; some are .55.

The specimen described appears almost black, its general tint is so dark. The hairs, however, on the back and sides have short tips of grayish brown, barely with a pale fulvous tinge, most conspicuous along the side of the head. The under parts are dark lead color, with a hoary gray tinge caused by the colored tips being hoary, the general impressing being a plumbeous hoary. The line of separation between the colors of the sides and belly is appreciable, but not distinct. The tail is dark brown above, plumbeous hoary beneath. The feet are dark brown.

The posterior upper molar has one anterior triangle, one interior, and two exterior, besides an unusually long posterior bent crescent which occupies nearly half the tooth. The posterior outer triangle, however, is very small, and rests on the curve of the crescent. The crescent sends forth a supplementary lobe from its inner side. There are four salient angles on the inside of the tooth, besides the posterior loop of the crescent, which may be called a fifth, and three exterior ones, besides the convexity of the crescent. The anterior lower molar has one posterior triangle, three exterior, and three interior; the anterior trefoil thus has its external loop converted into a closed triangle, the anterior loop and inner lateral one opening broadly into each other. There are five interior salient angles, besides a partial one produced by the bending in of the anterior loop. The exterior angles are four, besides the convexity of the anterior loop.

A still younger *Arvicola* (593) was brought from the same locality, Sawatch Pass, and is probably distinct, although too immature to characterize with any safety. The feet and tail are shorter in proportion. The ears are similar, and also concealed beneath the skin. The upper parts and sides have a clear uniform wash of yellowish rufous, with a slight mixture of black, which scarcely obscures the color. The belly is an ashy white, showing the plumbeous base of the fur. The feet are brown; the tail brown above and white beneath.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by—
						Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Longest toe.	Longest finger.	Height of ear.	
594	1717	Sawatch Pass, R. Mts..	Capt. Beckwith....	16	Skin	2.75	.90	1.00	.40	.70	.23	.22	.35	Mr. Kreutzfeldt..
? 593	1718	do.....	 do.....	17	...do....	2.75	.....	1.00	.35	.65	.22	.....	.35	do.....

ARVICOLA (CHILOTUS) OREGONI, Bachman.

Arvicola oregoni, BACHMAN, J. A. N. Sc. Phila. VIII, 1, 1839, 60.—IB. in Townsend's Narrative, 1839, 315.

AUD. & BACH. N. Am. Quad. III, 1853, 232; pl. cxlvii, f. 3.

SP. CH.—About the size and shape of *Arvicola pinetorum*, ($3\frac{1}{2}$ inches). Skull .92. Fur short, ($\frac{1}{3}$ of an inch). Head short, broad. Ears moderate, barely concealed, quite naked, with a few scattered inconspicuous white hairs. Antitragus small. Tail vertebrae not one-third the head and body, longer than the head, one and one-half times the hind feet. Soles hairy for posterior third, ($\frac{1}{3}$.65 long). For additional characters see *Chilotus*, page 516.

Above, dark brown, without any rufous tint. Hairs with obscure tips of yellowish brown. Beneath, lustrous hoary plumbeous ash. Tail corresponding in color to the body, but not sharply bicolored. Feet grayish brown.

This diminutive *Arvicola* is about the size of northern specimens of *Arvicola pinetorum*. The head is short and broad; the whiskers about as long as the head, mixed gray and black. The ears are moderate; barely covered by the fur; the upper margin inflexed; the auditory aperture is small; the antitragus short and low. The membrane of the ear is rather thick; at first sight it appears perfectly naked on both sides, but a close examination reveals a few short scattered hairs, except on the upper part of the convexity, where they are long, as on the neck. The feet are moderate, the hinder ones proportionally longer than in *A. pinetorum*. The sole is hairy for rather more than its posterior third. The tail is longer than the head and about one and a half times the length of the hind feet; it tapers gently to the tip.

The fur is compact, close, and has considerable lustre; it measures about three-tenths of an inch, rather less beneath. The prevailing color above is a dark brown, without any distinct rufous or chestnut; the hairs are tipped with yellowish brown, but so much overlaid with black tipped hairs as to produce a fine and equal mixture of the two. The under parts are ashy plumbeous. The feet are light grayish brown. The tail is brown above, plumbeous ash beneath, the colors passing insensibly into each other.

Skull.—The skull is short, broad, and depressed; less so, however, than in *A. pinetorum*. The interparietal portion is widest at its posterior portion, the lateral extremities being obliquely truncate. The nasal bones and nasal branches of the intermaxillary are of equal length, and reach back as far as the lachrymal. The distance from the anterior extremity of the upper molars to the posterior base of the incisors is not quite one-third that from the incisors to the occiput. The line of upper molars is contained about four-and-a-half times in the total length of the head. The width of the head is about 58 hundredths the length.

The middle upper molar has four triangles, the posterior one exterior. The posterior molar has one anterior triangle, one internal and two external, besides the posterior loop, which is somewhat Y-shaped, if the posterior outer triangle be included in it; the loop has a re-entrant angle indented in its inner side. There are three salient angles on the exterior of the tooth, with a long concave line behind them—three inside, or even four, counting the angle behind the indentation of the posterior loop. The first and third upper molars are about equal, the middle one a little smaller.

The anterior upper molar on the left side has one posterior triangle, and three on each side, besides an anterior trefoil loop, the external lobe of which is obliterated. That of the right side is similar, except that there are but two external triangles, the first anterior outer being confluent with the anterior loop, and forming the outer lobe of the trefoil wanting in the tooth of the opposite side. There are five internal salient angles and four external, besides the anterior loop.

The only American species with which this *Arvicola* need be compared are those of which *A. pinetorum* is the type. From these, however, it differs not only in its much darker color, but by the large, more orbicular and naked ears, smaller fore feet, larger hind feet. The fore claws, also, are not longer than the hind. The differences in the skull are considerable.

A specimen in alcohol, from Steilacoom, received since the preceding description was prepared, is, in size, much as described. The ears are low, orbicular, the membrane thickened, the margins or conchal portion much inflected or incurved, like a half open apple blossom, the concha being inflected all round. The antitragus is well developed, but rather low. The surfaces of the ear appear perfectly naked, with, however, a ciliation of long hairs towards the roots of the concha, on the dorsal surface. A close examination of the auricle in the dried specimen shows a few scattered, very short, white hairs.

The structure of the ear, though in many respects similar to that of *A. pinetorum*, is yet essentially different. Thus the upper and lower roots of the margin of the ear meet anteriorly so as to form even a low rim to the meatus anteriorly, completely enclosing the aperture; the edge of the concha is inflected; the region inside the auricle, around the meatus, naked, and the antitragus so much developed as to be capable of completely closing the meatus. In *A. pinetorum* the roots of the upper and lower margins of the ear are widely separated, by a space of a quarter of an inch, the space between these roots and anterior to the meatus perfectly plane; the edges of the concha, or of the auricle, not inflected at all; the inner space around the meatus partly hairy; the antitragus very slightly developed, not valvular, nor capable of closing the meatus at all.

The eyes are very small; about as in *A. pinetorum*. The feet, also, resemble that species; the sole is hairy from the heel to the first toe.

An alcoholic specimen from Tomales Bay agrees with this in nearly all respects, except that the ear is smaller, and, though nearly naked, has a few long hairs on the inside of the ear, just within the concha.

I cannot make out the character of the tubercles on the soles of the Steilacoom specimen; in that from Tomales Bay there are but five, as in *A. pinetorum*; a sixth may be present, but it is very rudimentary.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Height of ear.
1283 ¹	3232	♂	Shoalwater Bay, W. T...	Aug. 1855	Dr. J. G. Cooper.....	Skin .....	.....	.....	.....	3.50	1.10	1.25	.38	.65	.92	.51	.98
2529	.....	.....	Steilacoom, W. T.....	1855	Dr. G. Suckley	In alc ...	.43	.75	1.00	3.23	1.20	.....	.40	.61	.....	.....	.....
2533	.....	.....	Tomales Bay, Cal.....	1855	E. Samuels.....	...do	.40	.80	1.05	2.88	1.08	.....	.35	.56	.....	.....	.....

¹ Length of body before skinning, 3.60; of tail, 1.13.

ARVICOLA (PEDOMYS) AUSTERA, Leconte.

Prairie Meadow-Mouse.

Arvicola austerus, LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 405. (Wisconsin.)

AUD. & BACH. N. Am. Quad. III, 1854, 289. (From Leconte.)

KENNICOTT, in Agric. Rep. U. S. Patent Office for 1856, (1857,) 97, pl. xii.

Sp. CH.—Size of *A. riparius* ($4\frac{1}{4}$ inches.) Skull 1.10 inch. Winter fur long (half an inch.) Ears short, concealed, more than half the length of hind foot; thinly coated with long hair. Fore feet long and broad, more than half as long as hinder, which measure .8 of an inch. Half of sole hairy. Toes short. Tail short, scarcely longer than head, less than one-third the head and body; the vertebrae $1\frac{1}{2}$ times the hind foot.

Above, pale cinnamon rufous, variegated with black, paler on the sides. Beneath, pure pale cinnamon, brighter than above; the colors of the back, sides, and belly melting insensibly in each other. Tail sharply bicolor, like the corresponding regions of body; darkest at tip. Basal plumbeous of the fur becoming darker towards the extremity.

Skull rather broad. Length to width as 100 to 56. Line of molars about one-fourth as long as the head.

This species is of rather large size, and very stout in proportion to its length. The fur is only moderately soft, and thickly interspersed with long bristly hairs projecting considerably beyond the rest and overlaying them. The winter fur measures about half an inch above, half as much below, the summer fur about .35.

The muzzle is short and broad, the whiskers shorter than the head; brown and plumbeous. The ears are short and broad, completely concealed under the fur; more than half the length of the hind foot; they are thinly covered with long hair on both sides except around the meatus; the antitragus is very large, semicircular, and apparently capable of closing the meatus entirely.

The hind feet are rather small in proportion to the anterior, which are broad and quite fossorial. There is a short blunt claw attached to the obsolete thumb; the third finger is longest; the fourth a little shorter, the second claw extends to or a little beyond the base of the third; the tip of the fifth barely reaches the base of the fourth claw. The hind foot is apparently covered with hair for the posterior half of its lower surface, although a careful examination shows that the median line of this hairiness anteriorly is bare and overlapped by the lateral hairs. The toes are rather short; the first shortest, its claw scarcely reaching to the fissure between the second and third; the third is longest, the fourth barely shorter; the second still shorter; the base of the fifth claw is opposite the fissure between the third and fourth. The claws are rather long, and considerably curved.

The tail is short, the vertebrae scarcely longer than the head, in some specimens even shorter, it is well covered with appressed stiff hairs about equal in length, and there is a scanty pencil at the tip.¹

The upper fur is dark lead color, becoming a little darker just before the grayish pale cinnamon tips. There are many long black hairs equally interspersed which relieve the cinnamon, and

¹ The following account of the head and feet, taken from an alcoholic specimen, will serve to give a more accurate idea of the portions of the body than what I have derived from the examination of skins merely.

The head of this species is short and broad, as in the Arvicolae generally; the eyes rather large for the genus; the muzzle hairy except on the septum. The upper lip is emarginate, but not actually cleft beyond the base of the incisors. The ear is quite large; the membrane thickened; the anterior edge apparently not inflected; the antitragus much developed into a semicircular valve capable of closing the meatus. The inferior edge of the ear, near its lower root, or what, perhaps, corresponds to the antitragus better than the valve, just referred to, is dilated more than in other forms of *Arvicola*, so as to render the auricle considerably broader than high.

The palms are rather weak, the soles naked, with five tubercles. The hind feet are short, stout, and with but five tubercles, the posterior one on the outer edge of the sole being obsolete, or wanting entirely. The sole is densely hairy from the heel to the first tubercles.

in some specimens they predominate along the back. The sides are rather paler. The belly is a pale cinnamon, brighter than that of the upper parts; the colors of the sides and belly melt quite insensibly into each other. The basal lead color of the under fur is generally seen to a greater or less extent. The feet and upper part of the tail are colored somewhat like the back, or cinnamon brown lined equally with black, the tail darkest, sometimes nearly uniform blackish brown, especially towards the tip; the under part of the tail like the belly.

There does not appear to be much variation in the colors of this species, except that in a midsummer specimen the colors are a little brighter and darker cinnamon. Winter specimens are paler. A skin from St. Louis has the longest fur of all the skins in the collection, and has the cinnamon color of the belly very distinct.

	1469. ¹	No. 740. ¹	No. 987. ²	No. 266. ²
	Inches.	Inches.	Inches.	Inches.
Head and body.....	4	4.50	4.60	4.25
Tail, vertebræ.....	1.20	broken.	1.00	1.30
hairs.....	1.35	.....	1.20	1.50
Hind foot.....	.80	.80	.80	.80
longest toe.....	.20	.22	.28	.....
Fore foot.....	.45	.43	.43	.....
longest toe.....	.25	.22	.....	.....
Ear.....	.35	.45	.42	.....

¹ From West Northfield ² From Racine.

1999. The skull of this species is of average breadth among *Arvicolae*, its dimensions being (in No 1999) 1.10 inch by 63, or as 100 : 57. The cerebral portion is rather short, the narrowing of the interorbital space commencing about the middle of the axial line of the skull, or even a little behind it. The nasal branches of the intermaxillary extend further back on the forehead than the nasal bone, and in some cases pass the line of the lachrymals. The line of molars is short in the upper jaw, less than one-fourth the length of the skull. The distance from the upper molars to the posterior face of the incisors is about one-third that from the incisors to the occiput, or a little more in some specimens.

The posterior upper molar is about equal to the middle one, and shorter than the anterior; it is composed of one anterior triangle, one exterior, one interior, and one posterior loop or hook. This loop is somewhat V-shaped, connected with the pedicel of the interior triangles by its outer leg; it is rather acute behind, and both legs are slightly concave both on the inner face of the tooth, and the outer. There are thus but three salient angles on either side, including the posterior loop.

The anterior lower molar is less than half as long as the other two. It presents five internal salient angles and four external, besides the anterior loop which is angular on the side and may be considered as forming an additional angle, especially externally. There are, however, of completely closed triangles, one posterior, two internal and one external; the anterior lobe has two salient angles on either side, and an anterior sub-angular loop, the dentine in all broadly communicating.

In one specimen, 1997, the skull of which is larger than others, the teeth are wider; the first

anterior pair of re-entrant angles in the anterior lower molar come so close together as to cut off the isthmus of dentine ; the result of this is to divide the anterior indented lobe into two spaces, an anterior sub-quadrangular and a posterior sub-triangular, and extending across the tooth. This can scarcely be considered an exception to the characteristics given above, however.

This, the most common arvicola about West Northfield, varies a good deal in its characters, being sometimes almost black above ; sometimes the dull faded cinnamon of the belly is brighter, sometimes paler ; occasionally almost absent, leaving the basal plumbeous color most distinct.

The description I have given of the species differs somewhat from that of Major Leconte ; but his original (belonging to the collection of the Smithsonian Institution) is one of the few in which the cinnamon tips of the hairs are inappreciable. There can be no question of their being the same.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.									
						Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Skull, length.	Skull, width.
266	1999	..	Racine, Wis.	Dr. P. R. Hoy	Skin .....	.....	.....	.....	.....	.....	.....	.....	.....	1.12	.62
2928	.....	♂	do	A. C. Barry	In alcohol..	.49	.91	1.19	3.75	1.25	1.44	.38	.....	.....	.....
2897	.....	.....	do	Dr. P. R. Hoy	do	.45	.....	.....	.....	1.17	1.42	.37	.73	.....	.....
2923	.....	♂	West Northfield, Ill.	R. Kennicott	do	.41	.88	1.10	3.75	1.11	1.31	.38	.72	.....	.....
2925	.....	.....	do	do	do	.42	.88	1.05	3.25	1.04	1.14	.37	.72	.....	.....
2931	.....	♂	do	do	do	.50	.99	1.26	4.18	1.27	1.53	.40	.81	.....	.....
2932	.....	♂	do	do	do	.48	.98	1.30	4.00	1.28	1.61	.38	.71	.....	.....
2933	.....	♂	do	do	do	.45	.93	1.19	3.40	1.21	1.48	.40	.75	.....	.....
2936	.....	♂	do	do	do	.50	.98	1.26	3.70	1.17	1.40	.35	.70	.....	.....
2893	.....	.....	St. Louis.....	Dr. Engelmann.....	do	.47	.85	1.10	3.35	1.00	1.13	.32	.72	.....	.....
572	1647	.....	do	do	Skin .....	.....	.....	.....	4.00	1.20	1.40	.30	.80	1.06	.61
453	1587	.....	Calcasieu, La.	G. Wurdemann.....	do .....	.....	.....	.....	.....	.....	.....	.....	.....	1.10	.....

ARVICOLA (PEDOMYS) CINNAMONEA, Baird.

SP. CH.—Size of *A. austerus*, 4.50 inches. Skull 1.12. Head narrow. Fur coarse, .4 of an inch above. Ears small ; well furred ; half as long as the hind feet. Feet rather large ; hinder ones hairy beneath for half their length. Tail vertebrae one-third the head and body ; not twice as long as hind feet.

Above and on the sides, yellowish brown, mixed finely with black, but not obscured by it ; less black on the sides. A wash of dark rufous along the back. Belly pale cinnamon. No distinct line of demarcation between the colors. Fur above darker plumbeous, just before the brown tips. Tail strongly bicolor, colored like the corresponding regions of the body ; darkest at the tip.

Skull very narrow. Length to width as 100 to 50. Muzzle very long. Line of molars scarcely one-fifth as long as the head.

This species is of rather large size, and stout in proportion. The fur is rather coarse and stiff, especially the longer bristly hairs ; it measures about four-tenths of an inch above. The ears are small, longer than broad (.4 inch) ; rather thickly covered with long hairs on both sides so as to hide the margin ; the antitragus is of considerable development. The feet are large and stout ; the thumb of the fore foot rudimentary or obsolete, enveloped or encircled in

its upper half by a broad, blunt nail. The first toe of the hind foot is short; its insertion far back and falling opposite to the middle of the foot, or even posterior to this point. The under half of the sole is hairy from the heel. The tail is rather long for species of this group; exclusive of the hairy tip, it is about one-third the length of the head and body; well covered with hairs to the tip.

The upper fur is plumbeous from the base to near the tip, where the color deepens in intensity, and is succeeded abruptly by a yellowish brown tip. Interspersed are numerous hairs entirely black, which mix with the yellowish brown without obscuring or overshadowing it. This condition prevails on the upper parts and sides generally; the side of the body being only a little less mixed with black. There is also a faint wash of darker rufous brown along the middle of the back. Beneath, the lead colored fur is tipped with pale rufous or cinnamon. The feet and tail above are brown, finely lined or streaked with pale rufous or cinnamon in less quantity than the brown. The tip of the tail is brown; its under parts like the belly. The sides of the muzzle and the tip of the chin are dark brown, but the bend of the lips is whitish.

The skull is remarkable for its elongation, especially of the nasal portion. It is just twice as long as broad, measuring 1.12 by 56, or as 100 to 50. The nasal branches of the intermaxillary extend backward beyond the lachrymals, and exceed the truncated extremity of the nasal bones by one-tenth of an inch. The distance from the anterior extremity of the line of upper molars to the posterior base of incisors is more than one-third the distance from the incisors to the occiput (.37 to 1.05). The line of upper molars is short, (.27,) or about 24 hundredths the total length. The nasal bones measure .33 of an inch, or .29½ of the total length.

The posterior upper molar has three salient angles on both the exterior and interior sides; the posterior outer, however, is quite small, and even almost obsolete. The indentations of enamel are such as not to cut off any lateral triangles, there being one anterior and one middle one going entirely across the tooth, instead of an anterior and an exterior and interior. There is also the usual posterior loop. The anterior lower molar has one posterior closed triangle, two interior, one exterior, and an anterior lobe with an indentation in each side, making five internal salient angles, four external ones, and an anterior loop.

Judging from the skin alone, it would be rather hazardous to establish this *Arvicola* as distinct from *A. austera*, the external differences being but slight. The skull, however, has several peculiarities which I have not observed in a considerable number of specimens; none of those in the collection from Wisconsin, Illinois, Missouri, or Louisiana, sharing them in any way, although varying considerably among themselves. The rudimentary thumb nail is armed with a nail rather larger than usual, being, in fact, like one of the other claws, with the point worn off bluntly, and not continuous beneath nor enveloping the phalanx below. The tail is longer than in the others; with the hairs, measuring over 1½ inch, or one-third the length of the head and body; it is thinner than in all the allied species. The ears are smaller. The cinnamon of the under parts is rather deeper, as is the brown about the muzzle.

The points in which the skull of this specimen differs from those of *A. austera* are the narrowness compared with the length (one-half); the elongation of the nasal bones, and of the muzzle generally; the shortness of the lines of molars; the absence of any lateral triangles in the posterior upper molar, &c.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.									Remarks.
					Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.	Length of skull.	Width of skull.	Height of ear.	
591 ¹	1714	Pembina, Minn.....	C. Cavileer	Skin	1.25	4.50	1.42	1.66	.....	.....	1.13	.57	.....	Fresh
					.....	4.20	1.30	1.50	.40	.79	.....	.....	.40	Skin

¹ Measured before skinning.

ARVICOLA (PEDOMYS) HAYDENII, Baird.

SP. CH.—Larger than *A. austera*. Length, $4\frac{1}{2}$ inches. Tail vertebræ one third this length; not quite twice the hind feet. Fur coarse, half an inch long above. Ears short, half as long as hind foot; sparsely furred with longish hairs. Feet broad; sole hairy for half its length.

Above, yellowish brown, uniformly mixed with black; the whole with a gray tint. Sides grayer and with less black. Beneath, grayish white without any cinnamon. Line separating the sides and belly distinct; cheeks light colored. Tail sharply bicolor; colored in correspondence with the body. Plumbeous of fur deepening just before the brown tip. Skull 1.14 by .65, or as 100 to 57.

This species is amongst the largest of those occurring within the limits of the United States. The head is broad and rather obtuse. The whiskers are shorter than the head, black and gray. The ears are short, almost broader than long, rather sparsely covered with long hairs on both sides, except around the meatus; the antitragus large and semi-circular. The feet are stout, rather large; the nail-like claw of the rudimentary thumb well developed. The sole is hairy beneath for half its length from the heel; the insertion of the first toe is opposite the centre of the foot. The tail is short, about one-third as long as the head and body, tapering to a slight pencil at tip, and coated with stiff hairs throughout.

The hair is quite coarse and bristly, especially about the head; on the back it measures about half an inch; half as much on the under surface.

The fur is plumbeous from the base to near the tip, where there is a penultimate deepening in color, succeeded by a tip of yellowish brown. This being relieved by black tipped hairs gives a uniformly mixed color above, the prevailing tint of which is a grayish yellowish brown. The sides are grayer and less mixed with black. The under fur is broadly tipped with grayish yellow white, having a tinge of pale yellowish rusty across the belly. There is, however, no trace of cinnamon. The feet are pale rusty yellowish white above, with a few black hairs; the tail above is brown; beneath, like the belly, with a very distinct separation.

The skull resembles more *Arvicola austera* in shape than *A. cinnamonea*, although the contraction of the interorbital portion does not extend so far back, falling anterior to the central point of the skull. The distance from the anterior extremity of the upper molars to the posterior base of the upper incisors is one-third that from the incisors to the occiput. The line of upper molars measures .25 of an inch, or .22 of the total length. The posterior upper molar has an anterior triangle, next one exterior, next one interior, and behind these a broad V-shaped loop, with concave exteriors. The lower jaw is very massive; the anterior molar with one

posterior triangle, two internal, one external, and an anterior lobe indented on each side so deeply that the enamel nearly meets; there is also a shallow indentation anterior to these on each side. There are thus five distinct salient internal angles, four external, and a slight additional one on each side of the loop anterior to the others.

This species is rather larger than the *Arvicola austera*. It differs from it also in the more bristly character of the hair. The ears are shorter and broader. The colors differ considerably in a prevailing grayer tint above. The cheeks are much lighter, as is also the side of the muzzle. The under parts are whiter, the light tips being longer; they are without the cinnamon tinge of the other species. The feet are whiter.

In some respects this species seems to approach the *A. drummondii*. The latter, however, is said to have the tail shorter, (one inch,) and the prevailing color above, a brownish gray tinged with red. In the *A. haydeni*, however, the tail is $1\frac{1}{2}$ inch long, and the prevailing color grayish yellow brown, without any tinge of red or chestnut whatever.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When col- lected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—	
							Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height.		Longest toe.
699 ¹	1862	♂	Fort Pierre, Nebraska	1854.....	Col. A. Vaughan...	Skin	1.25	4.50	1.50	1.60	....	1.14	.65	....	....	Dr. F. V. Hayden.
.....	.....	.....	.....	.....	.....	.....	4.25	1.40	1.55	.81	....	....	.40	.35	.....	.....

¹ The first line gives the measurements taken before skinning; the second, those of the dried skin.

ARVICOLA (PITYMYS) PINETORUM, Leconte.

Psammomys pinetorum, LECONTE, Annals N. Y. Lyceum, III, 1, 1829, 132; pl. ii.

Pitymys pinetorum, McMURTRIE, Cuvier, R. A. Amer. ed. Appendix, I, 1831, 434.

Pinemys pinetorum, LESSON, Nouv. Tabl. R. A. 1842, 12.

Arvicola pinetorum, AUD. & BACH. N. Am. Quad. II, 1851, 216; pl. lxxx.

LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 409.

Arvicola scalopsoides, AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 299. (Long Island.)

WAGNER, Wiegmann's Archiv, 1843, II, 53.

? LECONTE, Pr. A. N. Sc. Phila. VI, Oct. 1853, 409.

? *Arvicola apella*, LECONTE, Pr. A. N. Sc. Phila. VI, 1856, 405.

SP. CH.—Length, $3\frac{1}{2}$ inches. Body elongated; head obtuse, short. Ears concealed, rounded, less than half the hind foot, covered with short, close hairs. Antitragus nearly obsolete. Tail shorter than the head. Fore feet large, three-fourths as long as the hinder, shrew-like; fore claws longest. Hind feet six-tenths of an inch long.

Fur short, close, lustrous, about one-fourth of an inch long. Above, dark, clear, chestnut brown; paler on the sides; beneath, hoary plumbeous. Feet light brown. Tail pale rufous beneath.

Skull, .95 by .58, or as 100 to 61. Muzzle rather short; its projection beyond the root of the zygoma less than the length of the line of upper molars.

Body cylindrical, narrow, and elongated. Head short and blunt. Whiskers shorter than the head; mixed black and gray. Eyes very small. Ears short, nearly orbicular, but broader

than long; less than half the length of the hind foot; covered with short close hairs; entirely concealed under the fur. Antitragus nearly obsolete. Hind feet very small, and fore feet very large, the latter with its claws, nearly as long as the former without them. Middle fore claws longer than hind ones; rudimentary thumb enveloped by a rather large blunt nail-like claw. Third finger longest; fourth and second successively shorter; claw of fifth reaching to the base of the fourth claw. Hands broader than the feet. Hind feet very short, about two-thirds the length of the tail vertebræ; the soles hairy for about the posterior third from heel, the hairs not reaching to the tubercles. The tail is very short; the vertebræ not so long as the head, tapering very slightly to near the tip; the hairs short, appressed, and with a short close pencil at the tip.

The fur above is very short, soft, and compact, scarcely over a quarter of an inch long; little shorter beneath; there are no longer bristly hairs projecting beyond the fur. In the smoothness and lustre of the fur, the cylindrical and elongated body, the short tail, and large and broad palms, there is a close resemblance to the larger American shrews.

The color of this species appears to present some variations with season. The upper parts and sides are a rich and rather dark chestnut brown, minutely and almost inappreciably lined with black. This last shade is imparted not only by interspersed hairs entirely black, but by black extremities to most of the chestnut tipped hairs. The sides are rather lighter chestnut. The under parts are dark plumbeous, with a wash of hoary whitish gray, and in some specimens a faint trace of pale rufous. The lead color is that of the base of the fur, and shows most conspicuously on the chin and throat, where the hair is very thin. The feet are light brown; the tail dusky at the tip; mixed brown and grayish above, and pale rufous below.

Specimens are sometimes so dark above as scarcely to convey the impression of a rufous or chestnut tinge to the fur.

The following table of measurements may serve to illustrate the difference between specimens before being skinned and after.

Measurements.

	879.	879.	882.	882.	1224.	1224.	1229.	1229.
	Fresh.	Dry.	Fresh.	Dry.	Fresh.	Dry.	Fresh.	Dry.
Head	1.00	-----	1.18	-----	1.10	-----	1.00	-----
Head and body	3.00	3.00	3.50	3.00	3.70	3.40	3.10	3.50
Tail, vertebræ	1.00	.85	.50	.60	.80	.70	.90	.78
with hairs	1.12	1.00	.67	.70	.90	.80	1.00	.92
Hind foot	-----	.65	-----	.60	-----	.65	-----	.60
longest claw	-----	.10	-----	.11	-----	.10	-----	.10
Fore foot	-----	.45	-----	.40	-----	.43	-----	.45
longest claw	-----	.11	-----	.13	-----	.14	-----	.13
Ear	-----	.22	-----	.25	-----	.24	-----	.25
Length of skull	-----	.95	-----	1.00	-----	-----	-----	.94
Width of skull	-----	.58	-----	.58	-----	.60	-----	.55
Proportions as 100 to	-----	61	-----	58	-----	-----	-----	59

In the alcoholic specimen the body is elongated and cylindrical; the fur short, close, and compact; the muzzle very blunt and rounded; the eyes very small, rather nearer the muzzle than the ear; the upper lip emarginate, but scarcely fissured or even furrowed beyond the emargination. The ears are very small, not as long as the adjacent fur; the concha slightly inflexed above; the two roots of the margin separated by a plane interval. The antitragus moderate, appearing scarcely sufficient to close the meatus; the surfaces of the ear apparently naked, with only a small fringe of long hairs on the concavity, near the superior margin. The legs are very short and weak. The fore feet very large, compared with the hinder, or rather longer than from heel to base of toes. Fore claws longest; thumb with a distinct, though short and obtuse-pointed claw; palms with five tubercles. Soles with only five tubercles; one at the bases of the third and fourth toes; one each at the bases of the second and fifth, and a fifth near the inner edge of the sole, as far behind that of the first toe as this is from the tubercle of the fifth; its anterior edge is about midway between the heel and the end of the balls of the toes. These tubercles are all large and conical, or pyramidal, and nearly of equal size. There is no trace of the sixth, usually seen near the exterior of the sole. The sole is hairy as far as the anterior edge of the posterior tubercle, though the hairs do not come up very close around it. The tail is very short, scarcely twice as long as the hind feet, which reach as far as its middle; it is well covered with hairs.

In a suckling female but two pairs of teats (inguinal) could be detected.

The skull of this species (1933) is very short and broad; the proportions of breadth to length being .60 to .97 of an inch, or as 64 to 100. The upper surface is considerably convex in every direction. The muzzle is short, the projection anterior to the base of the zygoma being .24, or about one-fourth the total length. The nasal bones are subtruncate behind, and extend back a little beyond the anterior of the external outline of the zygomatic arch; the nasal branches of the intermaxillary pass about a twentieth of an inch beyond or into the interorbital region. The interorbital portion of the forehead is rather broad, as wide as the widest part of the muzzle; about .19 the axial length. The cranium narrows suddenly to form the posterior portion of the orbit proper, the outline passing directly to the narrowest part of the interorbital portion perpendicular to the axis of the head, which is intersected a very little anterior to its middle points. The distance between the vertices of the angles of the cranium is .35 of an inch, or rather more than half the diameter of the head. The interparietal bone is subtriangular, obtuse angled anteriorly, slightly and irregularly convex posteriorly; the lateral extremities acute angled, sometimes blunt or rounded, scarcely truncate, nor with a projecting point from a posterior corner, as in *A. riparia*. The occipital foremen is nearly round, a little wider than high.

The lower jaw is short and stout, the coronoid process long and curved, rising a little higher than the condyle; the condyloid process rather deep.

The incisors are rather narrow. The upper are deeper antero-posteriorly than wide; their anterior surfaces nearly plane or rounding off very slightly; the width of the cutting edge about equal to the length of the anterior upper molar (.09 inch.) The distance from the posterior base of the incisors to the anterior extremity of the molars is one-third that of the occiput. The line of the molars is one-fourth the length of the skull (.24 of an inch.) The bony palate posteriorly has a fossa on either side against the inside of the posterior molar.

The anterior molar is composed of one anterior, two exterior, and two interior closed triangles; the first or anterior lateral triangle is interior, the last exterior. The second molar

has one anterior, one interior, and two exterior angles, the first and last lateral being both exterior, or the reverse of the first molar. The posterior upper molar has hardly any lateral triangles, the indentations of opposite sides being opposite and meeting, instead of alternating. There are, then, an anterior and a middle transverse triangle, with a posterior V-shaped loop, the outer leg of which connects with the adjacent inner salient angle. This V is usually slightly concave on either side, so as to make a Y. There are thus three inner salient angles, and two external, besides the V; the upper part of the external leg of this may sometimes carry a small additional external salient angle.

In the lower jaw the anterior molar is about as long as the two succeeding; the middle longer than the last, which is narrower than the preceding. The anterior molar has one posterior triangle, one external, and two internal; the anterior lobe has a deep re-entrant acute angle on either side, cutting off salient angles, and the sides of the anterior terminal loop are slightly indented, so as to be concave. There are thus an anterior loop, five salient angles on the inside, and four on the outside. The dentine of the two anterior on either side communicates with that of the loop.

The middle lower molar has an anterior and a posterior triangle, and a lateral on either side, making four. The posterior has the two lateral thrown into one transverse, making three transverse triangles.

With a limited number of specimens before me, when I first took up the examination of this species, I felt constrained to establish several species on what I considered good characters. A revision of the subject, however, with much more material at my command, has shown so many connecting links between the species, as established, that I can scarcely do less than throw them all into one. The size of the ear and of the body varies in different specimens from the same locality. The colors vary from rather bright chestnut to a darker tint, almost brown. This seems to be more usually the case with specimens from Illinois, although some are very similar to South Carolina skins. As a general rule, specimens from the low lands of the southern coast are smaller than those in the mountains or to the north. A specimen in alcohol, from Long Island, (Sag Harbor,) the locality of the original *Arvicola scalopsoides*, of Audubon and Bachman, exhibits no difference of apparent importance.

In one skin from Society Hill, the middle of the back is of a dark rufous brown; the sides bright yellowish chestnut as a broad stripe sharply defined against the color of the back; the belly is hoary whitish ash. The tail is bicolor. The contrast of color between the back and sides, I have observed in no other specimen.

It is quite possible that there may be more than one species included in the specimens enumerated, and it is more than likely that those from Illinois may eventually prove distinct.¹ Their most striking characters are the longer and looser fur, and its darker or more purplish color and gloss. I find no permanent characters, however, by which to separate the Long Island *scalopsoides* from the southern *pinetorum*.

¹ Should this Illinois species really be distinct, it may very appropriately be called *Arvicola kennicottii*. It cannot, with propriety, bear the name of *scalopsoides*.

List of specimens.

Catalogue number.	Corresp'ing No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.										
						Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Fore claw.	Hind claw.	Height of ear.
2837			Columbus, Ga.....	Dr. Gesner.....	In alco...	.45	.90	1 16	3.90	.80		.40	.62			
2841		♀	do.....	do.....	do.....	.47	.92	1.19	3.60	.78	.93	.46	.62			
248			Prairie Mer Rouge, La..	James Fairie	Skin.....											
249			do.....	do.....	do.....											
596	1719		Georgia.....	J. J. Audubon	do.....											
1364			South Carolina?.....	W. Cooper	do.....											
2876			Society Hill, S. C.....	M. A. Curtis.....	do.....											
674	1846		Raleigh, N. C.....	do.....	do.....											
879	1930	♀	Tarboro', N. C.....	J. L. Bridger.....	do.....			1.00	3.00	1.00	1.07					
882 ¹	1933	♂	do.....	do.....	do.....			1.17	3.50	.50	.66	.40	.61	.12	.10	.20
			Clover Green, Va.....	A. W. Massey.....	In alco...											
2842			Clark county, Va.....	Dr. Kennerly.....	do.....	.42				.64		.35	.63			
2843			do.....	do.....	do.....	.43	.83			.70	.88	.40	.64			
2844			do.....	do.....	do.....	.48	.95	1.19	3.60	.74	.89	.40	.66			
1224			do.....	do.....	Skin.....											
1229			do.....	do.....	do.....											
1441	2294	♀	Bladensburg, Md.....	B. O. Lowndes	do.....			1.17	4.17	.83	.93	.45	.69 ¹	.14	.10	.28
2919			do.....	do.....	In alco...											
2845			Carlisle, Penn.....	D. Miller, jr.....	do.....	.44	.85	1.15	3.53	.75	.93	.40	.62			.28
2846			do.....	do.....	do.....	.42	.84	1.05	3.38	.78	1.00	.38	.60			.33
2847		♂	do.....	do.....	do.....	.44	.83	1.13		.70	.90	.38	.62			.28
2848			do.....	do.....	do.....	.46	.90	1.15		.78	.97	.40	.63			.30
2836			Sag Harbor, Long Island	E. N. Byram.....	do.....	.43	.88	1.13	2.99	.82		.40	.65			.30
978		○	Ohio.....	R. Kennicott.....	Skin.....											
2834		○	West Northfield, Ill....	do.....	Alcohol	.30	.60	.84	2.27	.30		.25	.51			
2835			do.....	do.....	do.....	.46	.88					.40	.60			.38
2838		♂	do.....	do.....	do.....	.36	.72	.97	2 60	.80		.36	.65			
2839		♂	do.....	do.....	do.....	.42	.83	1.15	3.05	.78	.98	.35	.67			
2840			do.....	do.....	do.....	.35	.74	1.00	2.60	.78		.35	.64			
2920			do.....	do.....	do.....											
294			do.....	do.....	do.....											
743			do.....	do.....	Skin.....				3.50	.75	.85	.44	.65			.30
2880		♂	Anna, Ill.....	do.....	do.....											

¹ Skull, .98 by .57.

Having thus described all the species of North American *Arvicola* which I am now prepared to present, I shall proceed to an enumeration of the remaining ones described by authors, taking them up alphabetically. Most of these belong to section A. of *Hemiotomys*, and the greater part will, in all probability, prove to be synonyms of other species.

ARVICOLA ALBO-RUFESCENS, Emmons. Massachusetts.

Arvicola albo-rufescens, EMMONS, Rep. Quad. Mass. 1840, 60.

DEKAY, N. Y. Zool. I, 1842, 89; pl. xxiv, f. 1.

This species is characterised as having the fur entirely white; the hairs pale yellowish brown at the extremities; beneath white; upon the belly and chin paler than above. Feet and tail brownish. Head and body 3.80; tail vertebrae 1.30; ears .25; hind legs 1.00.

From the peculiar character of the white fur, colored only at the tips, this would seem, as suggested by *Audubon & Bachman*, to be merely a variety of some other species, such features being so far unknown as permanent ones in the *Arvicolae*. The two specimens collected by Professor Emmons were found at Williamstown, Massachusetts.

ARVICOLA APELLA, Leconte. Pennsylvania, (in fields.)

Arvicola apella, LECONTE, Pr. A. N. Sc. Phil. VI, 1856, 405.

AUD. & BACH. N. Am. Quad. III, 1854, 289, (from Lec.)

Above, brown, redder on the sides; beneath, gray, inclining to brownish on the chin and throat. Head short, blunt; ears very short, slightly hairy on both surfaces, entirely concealed. Legs very short; feet pale brownish. Tail very short; above brown, beneath grayish. Head, 1.00; head and body, 4.00; tail, .70; ears, .20; hind leg, 1.10 (including tibia).

This species, in all characteristics of form, and apparently of color, is the Pennsylvania *Arvicola pinetorum*, referred to above; at least I am unable to appreciate any difference from the descriptions.

ARVICOLA BOREALIS, Rich. Great Bear Lake.

Arvicola borealis, RICH. Zool. Jour. III, 1827, 517.—IB. F. Bor. Am. I, 1829, 127.

AUD. & BACH. N. Am. Quad. III, 1853, 134; pl. cxxix.

Hypudaus borealis, WAGNER, Suppl. Schreb. III, 1843, 593.

Tail as long as the head. Fur very long and fine, (ten lines;) thumb nail long, strap-shaped, somewhat as in the Lemmings. Fore claws longer and stronger than the hinder. Color above, dark umber or liver brown, without spots; beneath, lead gray, a rufous spot under the ears. Tail brown above, grayish white beneath.

In the description of Audubon & Bachman from Richardson's specimens, the prevailing color above is described as dark reddish brown; the hairs on the feet ochreous white.

Head and body, 4.50 inches; tail, 1.00; head, 1.25, height of ear, .33; width of ear, .25; fore feet, .38; hind feet .63.

The characters of this species are quite remarkable, and seem, as Richardson suggests, to indicate a connecting link between the meadow mice and the Lemmings. Nothing is said of the character of the soles, as to hairiness, &c.

ARVICOLA DEKAYI, Aud. & Bach. N. New York.

Arvicola dekayi, AUD. & BACH. N. Am. Quad. III, 1854, 287.

Arvicola fulva, AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 295, (name preoccupied.)

WAGNER, Wiegmann's Archiv, 1843, II, 53.

Fur short, smooth, compact, and lustrous; ears prominent, rising two lines above the fur. Tail longer than the head. Legs long and slender; the whole animal having the appearance of lightness and agility seen in the mouse. The hairs, which are very short, are above tipped with brown, causing a bright chestnut color; legs and toes a little lighter; color cinereous beneath. Incisors yellowish white. Head and body, 3.75 inches; tail, 1.33; height of ear, .21; tarsus, .60.

This animal, in all probability, will be found to belong either to *Hypudaus gapperi*, or to a closely allied species. It is very different from most other American *Arvicolae*. Unless the learned authors have actually compared their specimens with those of Dekay, I should be inclined to consider them mistaken in quoting *A. oneida* as a synonym; at any rate, the description of Dekay would seem to indicate an entirely different animal.

Audubon & Bachman first quoted their species as probably coming from Illinois. In the North American Quadrupeds, however, they speak of receiving their specimen from Mr. Fothergill, who obtained most of his animals (and very probably this one) in St. Lawrence county, New York. Should the species of Dekay and of Audubon & Bachman be the same, the name of the former must be retained.

ARVICOLA DRUMMONDII, Aud. & Bach. Rocky Mountains of British possessions.

Arvicola noveboracensis, RICH. F. B. A. I, 1829, 136.

Hypudaeus noveboracensis, WAGNER, Suppl. Schreb. III, 1841, 591.

Arvicola drummondii, AUD. & BACH. N. Am. Quad. III, 1853, 166; pl. cxxxv, (fig. with short tail.)

Ears projecting slightly from the fur. Tail more than half the length of the head, with scant hairs not concealing the scales. Legs very short; feet small; claws weak. Thumb with a nail. Fur coarse; on the back about eight lines long. Hair above, grayish black with a reddish brown subterminal annulus, and tipped with black. Prevailing colors above, a mixed dark reddish brown (or dark amber brown in some lights) and black; beneath, yellowish gray; around the eye, yellowish red, or a rufous spot beneath the ear. Tail above brown, beneath grayish white. Feet dark gray, tinged with rufous. Head and body, 4.25; head, 1.33. Tail, 1.42, (according to Aud. & Bach. only 1.) Length of feet not given.

This species is found in the northern Rocky Mountains, in company with *A. xanthognathus*.

I had at first been inclined to refer the *Arvicola haydeni* to this species, but its much darker and redder color, as described, appeared sufficient ground for distinction. It very possibly belongs to the same section, *Pedomys*.

ARVICOLA HIRSUTUS, Emmons. Mass.

Arvicola hirsutus, EMMONS, Rep. Quad. Mass. 1840, 60.

DEKAY, N. Y. Zool. I, 1842, 86; pl. xxv, fig. 2.

Above tawny, or reddish brown, intermixed with black tipped hairs; beneath, ash gray, never white. External ears partly concealed in the hair.

According to Dekay, the color above is similar to that of the brown rat; this passes on the belly into slaty gray. Feet dark brown. Tail brownish, lighter beneath. Length of head and body, 5 inches; of tail, 1.90.

This species appears to be very similar to *A. riparia*, to which it is referred by Audubon and Bachman.

ARVICOLA HYPOLEUCUS, Wagner. Labrador.

Hypudaeus hypoleucus, WAGNER, Wiegmann's Archiv, 1843, II, 142.

I have not found where, if at all, this species is described. It is only named in the above quotation. The author refers to a notice by Schubert in Münchner Gelehrte Anzeige, XVIII, 417, of Animals of Labrador, where the vernacular name, but no description of the animal, is given.

ARVICOLA LABRADORA.

I have seen somewhere a reference to such a species, but cannot find that it is anywhere described. It may possibly refer to the same animal as the preceding.

ARVICOLA NASUTA, Aud. & Bach. Mass.

Arvicola nasuta, AUD. & BACH. J. A. N. Sc. Phila. VIII, II, 1842, 296.—IN. N. Am. Quad. III, 1853, 211; pl. cxliv, fig. 2.

? LECONTE, Pr. A. N. Sc. Phila. VI, 1853, 407.

Very large. Tail shorter than the head; hind feet very short, little more than one-fourth the head. Nose sharper than usual. Color above rusty brown; the tips of the hairs yellowish brown and black; beneath soiled yellowish gray; legs and tail light brown; chin soiled white.

Head and body, 5.75; head, 1.83; tail, 1.17; hind foot, .50.

This species presents a combination of characters in the acute nose, large size, and short tail and feet, I have never seen at all. I can hardly help thinking there must be some mistake in reference to the brevity of the hind feet, so much less in proportion than that of any other known species.

I have had several skins of *Arvicola* exhibited to me as belonging to *A. nasuta*, principally on account of the sharpness of the nose. This, however, has proved to result from a neglect to replace the muscle of the head in stuffing; in none has there been any approach to the shortness of the hind feet described. In hundreds of specimens in alcohol, examined from Massachusetts, Vermont, and New York, I have seen nothing of the kind.

ARVICOLA OCHROGASTER, Wagner. North-America.

Arvicola ochrogaster, WAGNER, Suppl. Schreb. III, 1843, 592.

SCHINZ, Synopsis, II, 1845, 247.

This species, supposed to have come from America, is of a mixed yellowish brown and black; beneath light ochry yellow, more rusty towards the sides. The middle of the throat is whitish. Tail dark brown above, ochry yellow beneath, the two colors sharply defined. Length of the larger of two specimens along the curve of the back, 4.50 inches; in a straight line, 3.94; tail vertebrae, 1.08; with the hairs, 1.25.

I have never seen nor heard of any authentic American *Arvicola* of an ochry yellow beneath.

ARVICOLA ONEIDA, Dekay. New York.

Arvicola oneida, DEKAY, N. Y. Zool. I. 1842, 88; pl. xxv, fig. 1.

Ears nearly hidden in the fur. Above, brown or dark mouse color, with a slight mixture of tawny. (In the diagnosis, amber brown should probably read umber brown.) Beneath, light blue gray. Feet brownish black. Length of head and body, 3.20; tail, 1.25; fore legs, .40; hind legs, .70 (feet?). Fur about .20 long.

This species, as described by Dekay, presents few appreciable characteristics to distinguish it from young specimens belonging to the type of *riparia*. Audubon and Bachman are, I suspect, in error in referring their *A. fulvus* to this animal, probably belonging to *Hypudaeus gapperi*.

ARVICOLA RICHARDSONII, Dekay. Rocky Mountains of British America.

Arvicola riparius, (ORD) RICH. F. B. A. I, 1829, 120.

Arvicola richardsonii, DEKAY, N. Y. Zool. I, 1842, 91.

AUD. & BACH. N. Am. Quad. III, 1853, 163; plate cxxxv.

Ears somewhat concealed by the fur; tail about the length of the head; thumb armed with a nail; hind claws longest; incisors very large. Fur on the back about .66 of an inch, not very fine. Color above, dull dusky dark brown; the shade nearly uniform. Beneath, bluish gray; margin of upper lip, chin, and feet, dull white. Tail, dark brown above whitish beneath: these colors separated by an even line. Head and body, 7 inches; tail, 2.

This species appear to be well characterized and distinct from *A. riparia*. By a curious coincidence the same name was given to it by Dekay and by Audubon & Bachman, the latter authors not aware of what the former had done in the case.

ARVICOLA RUBRICATUS, Richardson. Behring's Straits.

Arvicola rubricatus, RICHARDSON, Zool. of Blossom, 1839, 7.

WAGNER, Suppl. Schreb. III, 1843, 594.

AUD. & BACH. N. Am. Quad. III. 1854, 297.

Size, a little greater than the common mouse. Slate color on the back; belly, ash-colored; sides, nearly scarlet; tail, rather short.

This species, were the colors of back and sides transposed, might be reasonably referred to the Kamtschatkan *Hypudaeus rutilus*. The well defined areas of dorsal and lateral colors distinguish it from *Arvicola occidentalis* of Peale, or *A. rufidorsum* of Baird.

ARVICOLA RUFESCENS, Dekay. Northern New York.*Arvicola rufescens*, DEKAY, N. Y. Zool. I, 1842, 85; plate xxii, fig. 1.

Ears large; rounded. Soles with six tubercles. Fur about three lines long. Upper molars with nine external angles. Color above, a bright reddish brown; the hairs light rufous at tips, intermixed with black pointed hairs. Beneath, bluish white; lighter on the inside of the thighs. Muzzle, darkish brown. Feet, light brown. Tail, dark brown above, cinereous beneath. Length of head and body, 3 inches; of tail, 2.

Whether this species is more than a rusty variety of some other, I am unprepared to say. It does not attain the vivid and continuous chestnut brown of the *A. rufidorsum*.

ARVICOLA SAYI, Bachman.

I have somewhere seen a reference to a species under this name, but cannot find that it has been anywhere described.

ARVICOLA TEXIANA, Audubon and Bachman. Texas.*Arvicola texiana*, AUD. & BACH. N. Am. Quad. III, 1853, 229; plate cxlviii, fig. 2.

Smaller than the cotton rat; ears large, ovate, extending beyond the fur. Outer and inner hind toes of equal length; the central three much longer, and nearly equal. Soles naked from the heel. Back brownish yellow, spotted with irregular small blotches of black. When the hair is laid smooth there is an obscure black stripe on the sides of the back, running from behind the shoulders towards the rump, and converging across the buttocks to a point at the insertion of the tail; the remainder of the back is irregularly or slightly waved or barred with dark brown spots on a yellowish ground. Head, yellowish brown. Sides of neck, and along the flanks to the hips, brownish yellow. A narrow line of yellowish white under the chin and on the belly. Tail, grayish white beneath. Ears, brownish yellow. Length to root of tail, 4.60 inches; to ear, 1.25; to eye, .50. Tail, 4; hind foot, 1.25. Found first on the Brasos, afterwards seen along the Nueces and Rio Grande.

This species is, in every probability, a *Sigmodon*, as shown by the short and nearly equal inner and outer toes, the naked soles, the long tail, &c. It appears to differ in important points of coloration from *S. berlandieri*, (page 504.) Should it really be a *Sigmodon*, there will be no record of the occurrence of *Arvicola* in Texas. Indeed, the only species of this genus I know, from the southern and gulf States, are the *A. pinetorum* and *A. austera*.

ARVICOLA XANTHOGNATHUS, Leach. Labrador and Hudson' Bay Territory.*Arvicola xanthognatha*, LEACH, Zool. Misc. I, 1814, 60, pl. xxvi.

J. SABINE, Zool. App. Franklin Narr., 18 , 660.

RICH, F. B. A. I, 1829, 122.

AUD. & BACH., N. Am. Quad. III, 1853, 67; pl. cxv, (description from Richardson.)

Ears large; tail shorter than the head, palms broader than the soles, the posterior half of the latter hairy. Fur long and soft; nine lines long on the back. Color above, a mixed dark brown and black, without spots, and varying in shade with the light; sides a little paler. Beneath, silvery bluish gray, darkening into blackish gray in two patches anterior to the shoulders. A blackish brown stripe along the centre of the nose, on each side of which is a reddish brown patch extending from the mouth to the orbit. Tail whitish beneath. Length to root of tail, 5½ to 8 inches. Head, 1.83; tail 1.50; ears, .60; hind foot, .83.

This species has never been established as occurring within the limits of the United States. DeKay¹, indeed, gives it as found in New York, but, as suggested by Audubon and Bachman, he probably had a variety of some better known species before him.

¹*Arvicola xanthognatha*, DE KAY, N. Y. Zool., I, 1842, 90; pl. xxiii, f. 2.

I have thus mentioned all the residuary species of N. American *Arvicola* that have come to my knowledge. There are still some others described as *Arvicola*, but really belonging to other genera, and have been already quoted under their appropriate heads. These are principally as follows:

Arvicola campestris, Aud. & Bach. = *Hesperomys campestris*, Lec. page 485.

ferrugineus, Harlan = *Sigmodon hispidus*, Say & Ord., page 502.

hortensis, Harlan = the same species, probably.

nuttalli, Harlan = *Hesperomys nuttalli*, page 467.

oryzivora, Aud. & Bach. = *Hesperomys*, (*Oryzomys*) *palustris*, page 482.

sonoriensis, Aud. & Bach. = *Hesperomys sonoriensis*, Lec. page 474.

texana, Aud. & Bach. = *Hesperomys texana*, Woodhouse, page 464.

texiana, Aud. & Bach. = *Sigmodon texiana*?, page 552.

Hypudaus leucogaster, Max. = *Hesperomys* (*Onychomys*) *leucogaster*, page 480.

The species in the preceding enumeration most likely to be additional to those I have described in detail are: *Arvicola borealis*, *drummondii*, *nasuta*,? *richardsonii*, *rubricata*, and *xanthognathus*.

MYODES, Pallas.

Lemmings.

Myodes, PALLAS, Zoog. Rosso—Asiatica I, 1811, 172.

Fore feet large; its claws very long, fossorial, longer than the hinder. Soles (and palms?) hairy to the roots of the toes. Tail shorter than the hind foot. Skull very broad; the zygoma high. Posterior lower molar composed of four subtriangular prisms, the anterior of not more than five. Root of lower incisor not passing beyond or under the posterior molar, as in *Arvicola*.

The *Lemmings*, with the same general appearance as the *Arvicolas*, can be readily distinguished externally, by the more or less hairy soles, very short tail, and long sickle-shaped claws, fitted for digging, the external ear either very small, or altogether wanting. The last lower molar is composed of four or five triangular prisms which alternate with each other as in *Fiber*, instead, as in *Arvicola*, of having three prisms composed of a greater number of triangles placed with their bases opposite each other and confluent, (the indentations opposite also,) and the tooth exhibiting therefore only three prisms, or three islands of dentine.

The species of this genus are confined to the arctic regions of the northern hemispheres. Three or four species belong to North America, but none have yet been found within the United States.

Not having access to all the authorities, I am unable to say whether the name of *Myodes* or *Lemmus* should be retained for this group. Pallas includes the *Arvicolae* with the Lemmings in establishing *Myodes*; and it is to Keyserling and Blasius that we owe the restriction of the name. It is possible that *Lemmus* was established by Linck after *Myodes*, and with the same wide application; in which case *Myodes* will be left for the Lemmings; *Arvicola* having been made by Lacépède in 1803 for the genuine field mice.

In any event the name of *Georychus*, used by Richardson and Audubon and Bachman, is inapplicable to the true Lemmings, as it was constructed by Illiger to receive the cape rat of south Africa, *Georychus capensis*; which, however apparently similar in external form, is so essentially distinct as to belong to an entirely different family.

In the absence of any specimens of typical *Myodes* from America, I am obliged to select one of the European species for the illustration of the genus. Of the four species in the collection of the Smithsonian Institution, *M. lemmus*, *torquatus*, *obensis*, and *schisticolor*, I choose the first mentioned as the best known type.

The body is stout; the head very broad and short; the legs are short and strong; the tail shorter than the hind foot. The hair is very coarse and bristly.

In the general character of the muzzle *Myodes* agrees with *Arvicola*. According to Keyserling and Blasius, the whiskers are arranged in five horizontal series. The ears are short and orbicular, and margin narrowly the large auditory aperture. They are thickened and nearly naked; very sparsely coated with short whitish hairs. (In *M. lemmus* they project above the head .2 of an inch; in some species they are much shorter.) There is no antitragus at all prominent, as in the *Arvicolae*.

The feet are short and strong; the fore feet much developed in size, measuring with the claws as much as the hind feet without them. The fore claws are very long, stout, and fossorial; considerably longer than the posterior. The palms are naked. The thumb is very short, nearly obsolete, armed with a compressed elongated strap-like nail, truncate at the end, .15 of

an inch long, and reaching to the base of the second claw. The third nail is longest; the fourth is a little shorter; the second reaches beyond the base of the third.

The hind feet are short and broad. The soles are densely hairy, except under the toes; the tubercles are naked, however. The three central toes are longest and nearly equal; the first claw extends nearly to the base of the second; the fifth beyond the base of the fourth; the first claw again reaches as far as the middle of the fifth. The longest toe, with claw, is about one-third the whole foot; without the claw, about one-sixth. The claws are long, curved, and compressed, channelled beneath; more curved than the anterior, which likewise are much channelled and blunted. All have stiff bristles covering their bases.

The tail is very short, shorter than the hind feet; densely coated with hair.

Myodes thus differ from *Arvicola* in the much broader head, shorter tail, much more fossorial fore feet, with very long claws; a long compressed strap-shaped nail to the thumb. The sole of the hind feet with hair to the roots of the toes.

The skull of this species is very massive and broad, measuring 1.30 by .87, or as 100 to 67 nearly. The muzzle is long in proportion, projecting beyond the zygoma between one-third and one-fourth the total length. It slopes very rapidly downwards in nearly a straight line; viewed from above, the nasal bones and nasal branches of the intermaxillaries are of equal length, and reach a little behind the anterior outline of the anterior root of the zygomatic arch, not to its posterior. The orbits proper are very large; the temporal fossæ small; the outline of the cranium proper nearly square. The interorbital region is much contracted, considerably narrower than the muzzle; there is an acute central crest, which bifurcates at the end of this region, and, passing backwards in a sigmoid curve to the nearly plane and vertical occiput, encloses a plane space on the top of the head. The interparietal bone occupies the posterior part of this plane; it is quadrangular, a little wider than long. The zygomatic arch is emarginated anteriorly at its base; its lateral outline is very high.

The bony palate ends behind in a shelf, projecting a little over the cavity of the internal vases; the structure here is intermediate between that of *Arvicola* and *Hypudaeus*. Thus, there is a fossa on each side against the inner side of the posterior molar, but these, in a measure, are pushed under the posterior extremity of the palatine arch. This posterior outline is broadly emarginated.

The line of molars is rather short, about one-fourth the total length; it is situated far back, the centre of the axis falling about opposite the middle of this line, or a very little anterior to it. The distance between the molars and incisors is more than one-third the total length. The lines of molars converge anteriorly, their inner outlines meeting at the incisors.

The incisors are thick and large; very much rounded anteriorly. The upper are bevelled on the exterior so much that no dentine is visible laterally. In fact, the tooth is an enamel tube, nearly meeting on the posterior side, their lower or terminal half, with half the tube cut away behind, and enclosing very little dentine.¹

The anterior molars of both jaws are longest; the others, successively, a little shorter. The lateral indentations of the enamel or re-entrant angles are very deep, extending almost entirely across the teeth; very conspicuously different in this respect from *Arvicola*, the triangle, also, being generally very narrow and elongated. The first upper molar is composed of five triangles, one anterior and two on each side; the first lateral being internal, the last external.

¹ The root of the lower incisor ends on the inside of the line of molars opposite the middle of the posterior molar, instead of passing under the posterior molar, and extending to the posterior edge of the condyloid process.

There are two re-entrant and three salient angles on each side. The middle molar has four narrow elongated triangles—the first and second entirely transverse; the third internal; the fourth external. The first and second triangles are in contact on the inner edge of the tooth. There are three external and two internal salient angles, and two re-entrant external, one internal. The posterior molar has four triangles, the two anterior entirely transverse, and united on the inner edge of the molar, as in the middle molar; the two posterior triangles likewise transverse, but united on the exterior of the tube; the stem connecting the second and third a little exterior to the middle. There are three salient angles, and two re-entrant on each side.

The lower anterior molar has one posterior, one external, and two internal triangles, and an anterior small quadrangular loop. The middle molar is very similar, the anterior quadrangular loop, however, replaced by an internal triangle, making two lateral on each side, or five in all. The posterior has four triangles, the two posterior entirely transverse, and connected on the exterior of the tooth; the outlines of each distinct. The other triangles are lateral on either side.

To sum up the whole statement in reference to the molars, the anterior in both jaws have five prisms, each with closed triangular or sub-triangular sections; the posterior with four; the middle upper has four, the middle lower five. The posterior molars are as wide as the anterior.

Myodes schisticolor differs a little from *lemmus* in a less hairy sole, smaller fore claws, a rather narrower head, pentagonal interparietal, and a few other minor features of skull and teeth, to which I need not here enumerate. Both have the palate ending as in *Hypudaeus*, not *Arvicola*.

By the preceding description it will be seen that there are many points of difference between the skulls of *Myodes* and *Arvicola*, as in the former we have a much greater width of head, more contracted interorbital space, longer interparietal, deeper zygomatic arch. In the teeth the differences are very striking, especially in the depth of most of the re-entrant angles, which so often extend to the opposite side of the tooth. The posterior lower molar is composed of four sub-triangular prisms, not three, the anterior lower of five, while in *Arvicola* the number is always much greater.

I have given a minutely detailed description of the external anatomy of a European species of *Myodes*, (*M. lemmus* or *Lemmus norvegicus* of authors,) for the sake of illustrating a very remarkable specimen received from Mr. William Cooper, of Hoboken, and having all the external appearance of an *Arvicola*. In fact, truly a *Myodes* in its teeth, it constitutes a perfect link connecting the two genera. I cannot now say whether any of the Lemmings of arctic America are like it or not, but judge from the descriptions that they are all true *Myodes*.

The specimen in question, (No. 1367,) is in very imperfect condition, the tail, skin of the head, and all the feet, except one of the anterior, being deficient. A smaller skin, (1368,) lacking both the skin of the head and the skull, accompanied it, and probably belongs to the same species. No locality was assigned, but the animal is undoubtedly North American, probably from the New England States, or New York; possibly from Iowa or Minnesota.

The size is a little less than that of *A. riparia*. The fur is remarkably soft and full, over half an inch long, and has longer black hairs interspersed. The color is a light yellowish brown above, relieved by black, precisely as in *Arvicola*; the sides are rather paler; the underparts are hoary white.

The single remaining fore foot has lost the palm and the thumb claw, the rest of the hand is,

however, as in *Arvicola*, and is, indeed, rather weaker than usual—the claws no longer in proportion.

The second specimen referred to is probably of the same species. In it the fore feet have a thumb claw rather longer and more linear than in *Arvicola*, but not as large as in *Myodes*. The hind feet are short; the soles sparingly hairy to the roots of the toes; more pilose than in *Arvicola* usually—less than in *Myodes*; the toes about two-thirds as long as the rest of the foot. The proportions are as in *Arvicola*. The tail is short; densely hairy; the longest hairs on the terminal third, where the tail also appears to be depressed; it is about one and a half times as long as the hind foot. The feet and tail beneath are whitish; tail above, brown, with a distinct line of separation.

The skull is broader than in *Arvicola*, though the exact proportions cannot be ascertained, owing to its mutilated condition. The line of molars is long, and about equal to its distance from the posterior base of the incisors. The nasal bones and nasal branches of intermaxillary are equal, and scarcely pass the anterior line of the root of the zygoma. The cranium projects into the inter-zygomatic cavity much more than in *Arvicola*, filling it, as in *Myodes*, at the expense mainly of the temporal portion of the fossa. The zygomatic arch is very high in the middle portion, as in *Myodes*. The posterior extremity of the palate ends in two fossæ, as in *Arvicola*, not in a projecting shelf, as in *Myodes* and *Hypudæus*.

The lower jaw differs considerably from *Arvicola* in the greater size of the descending ramus, and the width of its posterior edge. As in *Myodes*, the root of the incisor passes along the inner and lower edge of the body of the jaw, and ends opposite the inner side of the root of the posterior molar, instead of passing on under this molar to the posterior edge of the condyloid process, as in *Arvicola*. The passage of the incisor along the inner edge of the body of the lower jaw gives to the jaw a very great massiveness, as seen from below. The deep excavation between the molars and the ascending ramus of *Arvicola* is wanting here.

The incisors are very thick and strong. The upper have the inner edge rounded a little, but the exterior is so strongly bevelled that nearly the entire surface is antero-external, instead of anterior. There is a conspicuous, rather broad, groove near the external edge of the tooth. Viewed laterally, the anterior two-thirds of the tooth is covered with enamel. The end of the incisor is channelled deeply in its central portion.

The molar teeth have exactly the structure of *Myodes*. The re-entrant angles are very deep, extending mostly to the opposite side of the tooth. The anterior upper molar is composed of five triangles—an anterior and posterior, two internal and one external lateral—though the posterior triangle may be considered as an external lateral. The middle molar has four triangles, an anterior, posterior, and one lateral on each side. The first and second triangles, however, really extend across the tooth the inner being the only truly lateral one. The posterior molar has four elongated triangles extending entirely across the tooth.

The anterior lower molar has five triangles, of which the anterior and two posterior extend entirely across the tooth. The first lateral is internal, and next to the anterior triangle; the second alternates with this, and is very small. The middle molar has four triangles, the anterior and two posterior going entirely across the tooth; the fourth is external, next to the anterior triangle, and hardly distinguishable. The posterior molar has, likewise, four prisms or triangles; it is a little smaller, but otherwise almost exactly like the middle one. The posterior molars of both jaws are equally wide with the rest.

The only difference in the teeth of this animal from *Myodes* is in having only four triangles

in the middle lower molar, the anterior fifth one of *M. lemmus* and *schisticolor* being deficient. Neither of these last species has anything like the conspicuous groove on the extero-anterior face of the upper incisors.

The differences from *Arvicola* are too great to need special expression. The four prisms of the posterior lower molar and the five of the anterior are all sufficient as characteristics.

Although there are not the means at hand to characterize this animal perfectly, either generally or specifically, yet its peculiarities are such as to render it not improper to give it a place in the zoological system by calling it *Synaptomys*, (*S. cooperi*), in reference to the close connexion it exhibits of the characters of *Arvicola* and *Myodes*.

I have already stated that no specimens of true *Myodes* from North America have fallen under my examination. For the sake of completing the account of the North American mammals, I propose to introduce brief diagnoses of the species described by authors. According to Middendorff,¹ who has had unequalled opportunities of investigating this genus in its native localities, many nominal species have been introduced into the system by describing the Old and New World *Lemmings* as distinct, when, in reality, they are the same; and this author finds a further source of error in the fact that the very different coloration of varying age, sex, and season, so little understood before the publication of his paper, has been made the basis of other nominal species. Middendorff reduces Richardson's four species, with a fifth from Sitka, described by Wagner as *Myodes albigularis*,² to two, *M. torquatus* and *M. obensis*. His synonymy, as relates to our species, is as follows:

MYODES TORQUATUS.

Mus torquatus, PALLAS, N. Sp. Quad. Glirium, 1778, 206.

Myodes torquatus, KEYS. & BLAS. Europ. Wirb. 1740, pp. vii and 32.

MIDDENDORFF, Sibir. Reise, II, ii, 1853, 87; pl. iv to vii, and x.

Mus hudsonius, PALLAS, N. Sp. Quad. Glirium, 1778, 208.

Myodes hudsonius, WAGNER, Suppl. Schreber, III, 1843, 604.

MIDDENDORFF, Bull. Classe. Math. Phys. Acad. Imp. St. Petersb. III, xix.

WIEGMANN'S Archiv, 1845, ii, 34.

Mus lenensis, PALL. N. Sp. &c. 1778, 195.

Lemmus hudsonius, SABINE, Suppl. App. Parry, 1824, 188.

Arvicola (*Gerychus*) *hudsonia*, RICH. F. B. A. I, 1829, 132.

Georychus hudsonius, AUD. & BACH. N. Am. Quad. III, 1853, 81; pl. cxix.

Mus groenlandicus, TRAILL in Scoresby's Greenland, 1823, 416.

Arvicola (*Georychus*) *groenlandicus*, RICH. F. B. A. I, 1829, 134.

Cuniculus groenlandicus, WAGLER, Isis, 1832, 1220.

Myodes groenlandicus, WAGNER, Suppl. Schreb. III, 1843, 606.

J. E. GRAY, Pr. Zool. Soc. Lond. XVI, 1848, 43.—In. Rae's Narrative, 1850.

Georychus groenlandicus, AUD. & BACH. N. A. Quad. III, 1854, 315.

Lemmus unguulatus, BAER, in Baer & Helmersen Beiträge IV, 1841, 283.

From the preceding list it will be seen that Middendorff makes *Myodes hudsonius* and *groenlandicus* synonyms of *torquatus*. The peculiarity of *hudsonius* is in having the two middle fore claws very large, much compressed, the extremities blunt, and divided by a terminal notch into two points, one above the other. This, however, has been observed in Asiatic specimens to a still greater degree than in American, giving rise to the *Lemmus unguulatus* of Baer.

There seems no good reason to contest the decision of Middendorff in regard to the species, as he examined all the English specimens upon which the descriptions of Richardson, Audubon and Bachman, and others, quoted above, are based. His article is very full, describing and

Middendorff, Sibirische Reise, II, ii, Wirbelthiere, 1853, 87—108.

Wagner, Suppl. Schreber's Säugethiere, III, 1843, 602.

figuring the variations of color, the osteology, &c. The animal is strictly circumpolar, coming further south, along Behring's Straits, than elsewhere. The N. P. Exploring Expedition, under Captain Rogers, collected specimens on the island of Arikamitchichi, in Behring's Straits, near the Asiatic shore.

MYODES OBENSIS, Brants.

Myodes obensis, BRANTS, Muizen, 1827, 55.

KEYSERLING & BLAS. Wirb. Europ. 1840, VI, pp. vii and 32.

MIDDENDORFF, Sibirische Reise, II, III, 1853, 99; pl. ii, figs. 7-9; pl. viii, ix. x. f. 2.

Arvicola (*Georychus*?) *helvolus*, RICH. F. B. A. I, 1829, 128.

Georychus helvolus, AUD. & BACH. N. Am. Quad. III, 1853, 84; pl. cxx, f. 1.

Arvicola (*Georychus*) *trimucronatus*, RICH. Parry 2d voyage, 1825, 309.—IB. F. B. A, I, 1829, 130.

Georychus trimucronatus, AUD. & BACH. N. Am. Quad. III, 1853, 86, pl. cxx, figs. 2. 3.

Myodes albigularis, WAGNER, Suppl. Schreber, III, 1843, 602.

This species is distinguished prominently from the preceding, according to Richardson, by the existence of a strap-shaped nail (claw?) to the thumb, instead of having the thumb very rudimentary, and without any nail.

The remaining species of *myodes* found in the Old World are *M. lemmus*, in Norway and Sweden, the typical Lemming of old authors; *M. schisticolor*, in Norway, and recently obtained on the west coast of the sea of Ochotsk, and *M. lagurus*, on the Ural river, and the steppes of Grand Tartary. Good specimens of all the known Old World species are in the collection of the Smithsonian Institution, with the exception of *M. lagurus*. The following diagnosis of the species is taken chiefly from Keyserling and Blasius.

a. With a sharply defined dark dorsal stripe from the middle of the crown to the tail.

1. A whitish collar, bordered before and behind with brown. (Very obsolete in some specimens.) Above, watered with pale yellow and reddish brown; paler on the sides. Beneath, whitish. Whiskers black.....*torquatus*.
2. Without white collar. Above, pale gray, mixed with dark brown hairs. Beneath, whitish gray. Upper whiskers brownish, lower whitish.....*lagurus*.

b. Without a sharply defined dark dorsal stripe.

3. Above, uniform brownish yellow, mixed with black hairs; the sides brighter yellowish. Under parts and legs, pale rust-yellow; toes and feet yellowish white; throat white.....*obensis*.
4. Black areas on the rusty red ground of the upper parts. Head, neck, and anterior part of the back brownish black; the hinder half of the back and the remainder of the upper part of the body with irregular black spots. Two elongated spots of yellowish red between the ears; beneath, rusty yellow; toes, dark brown; feet, yellowish*lemmus*.
5. Nearly uniform slaty plumbeous all over, with a reddish spot on the back. Fore claws but little developed*schisticolor*.

FIBER, Cuvier.

Fiber, CUVIER, "Leçons d'Anat. I, 1800."

Form somewhat arvicoline, except the tail, which is long, much compressed vertically, with scant hair; hind feet partly webbed; fore feet with stiff bristles. Teeth arvicoline, the posterior lower molar composed of four or, perhaps, five prisms, the re-entrant angles alternating, (if four, the anterior with a re-entering angle.)

The genus *Fiber*, based on a single species—the well known muskrat—is confined to North America, where it has an extensive range, except, perhaps, in its extreme northern and southern extremities. Although, in many points similar to the *Arvicolas*, yet the peculiarities of the tail and feet are not found in any *Arvicola*, all of which it greatly exceeds in size. The skull, too, although very similar in the two genera, yet possesses some appreciable distinctive characteristics.

The outlines of any single series of molars are formed by two straight lines approximating a little behind, more so above than below. The first upper molar is longest; the third is longer than the second, though not so wide. The crown of the first has two re-entrant angles on each side (and, of course, three salient ones); the second, two outside and one inside; the third, three outside and two inside. There are five prisms on the first molar, four on the second, and five on the third; these are mostly sub-triangular. The enamel loops, in all cases, alternate with each other, and extend across to the opposite enamel, completely isolating the dentine in each prism. In the first molar, the anterior indentation or re-entrant angle is internal, in the other two it is external.

In the lower jaw the first molar is much larger than the others; the second and third about equal in length. The first has five indentations or re-entrant angles inside and four outside; the second and third have each two on each side. These, with the triangles separated by them, are alternate, not opposite; most anterior in the first molar inside; in the others outside, as in the upper jaw; when the corresponding teeth of the two jaws are superimposed, however, these conditions are reversed. There are nine prisms in the first molar, and five in each of the others.

The re-entrant enamel folds in all the teeth extend across to the enamel on the opposite side, except in the case of the anterior pair of the first lower molar, which do not meet, and, perhaps, the posterior pair of the last upper molar.

The upper incisors are rather broadest; plane anteriorly, but considerably bevelled or rounded off at the outer edge; the lower are still more bevelled externally, so that their section is a spherical triangle with rounded corners.

A striking peculiarity of the skull in *Fiber* consists in the great expansion over the head, of the temporal bone, which, by the great compression between the orbits (the skull reduced to a less width than that of the end of the muzzle,) anteriorly forms a right angle projecting far into or over the orbit, the anterior legs of the two angles on opposite sides of the head in a straight line perpendicular to the axis of the head. The parietals are reduced to a small sub-orbicular space with various angles. The interparietal bone is nearly as long as broad, and one-third as large as either parietal. The occipital foramen is as broad as high.

FIBER ZIBETHICUS.

Musk Rat.

Castor zibethicus, LINN. Syst. Nat. I, 1766, 79.

ERXLEBEN, Syst. 1777, 444.

BODDAERT, El. Anim. I, 1784, 166.

PALLAS, Zoog. Rosso-Asiat. I, 144.

Mus zibethicus, GMELIN, Syst. Nat. I, 1788, 125.

SCHREBER, Säugt. IV, 1792, 638; tab. clxxvi. (*Ondatra* in text.)

SHAW, Gen. Zool. Mamm. II, 1801, 44; pl. cxxix.

Myocastor zibethicus,¹ KERR's Linnaeus, 1792.

Fiber zibethicus, CUVIER, R. A. I, 1817, 192.

DESMAREST, Mamm. II, 1822, 279.

HARLAN, F. Am. 1825, 132.

GRIFF. Cuv. V, 1827, 208.

RICHARDSON, F. B. A. I, 1829, 115.

DEKAY, N. Y. Zool. I, 1842, 75; pl. xx, fig. 2; pl. xxxii, fig. 3. (Skull.)

AUD. & BACH. N. Am. Quad. I, 1849, 108; pl. xiii.

KENNICOTT, Agric. Rep. U. S. Pat. Off. for 1856, (1857); plate xiv.

Lemmus zibethicus, FISCHER, Synopsis, 1829, 289.

Ondatra zibethicus, WATERHOUSE, Charlesw. Mag. N. H. III, 1839, 594, (fig. of skull.)

Musk beaver, PENNANT, Hist. Quad. 1781, No. 252.—Ib. Arctic Zool. I, 1784, 106. (Leverian Museum.)

Body thick and clumsy; in shape resembling the arvicolas. Neck indistinguishable. Feet moderately large. Tail about equal to the body without the head.

Head broad, depressed, acute. Eye very small; its long diameter not equal to the width of the two upper incisors; its centre about midway between the tip of the nose and the posterior margin of the ear. The ear is quite small; nearly as broad as high: truncate and rounded above; there is no distinct tragus, the cartilage being entirely straight in this region. The antitragus is, however, quite prominent, as a rectangular projection at the bottom of the external ear; there does not appear to be any natural arrangement in the ear to exclude water, but the dense fur with which both sides are coated, and completely concealing it, answers the same purpose. The external surface of the outer ear, however, is only hairy near the upper margin posteriorly, leaving the rest of this surface to the anterior edge of the ear, and around and above the meatus, entirely naked. The septum of the nostrils is thick, as wide as the upper incisors, and is marked longitudinally by a broad shallow groove. There is a small papilla on the posterior edge of the nostril which may serve as a valve to close it under water. The upper lip is not split, but is hairy between the incisors and the nose. The lips are thick and fleshy, the upper covered with hair a little within the margin. On each side of the upper lip there is an internal projecting flap, which, when the two are brought together, completely overlap and conceal the anterior portion of the palate, and reducing the opening of the mouth to a square aperture. There are somewhat similar flaps on the lower lip folding over the base of the incisors. On the inside of the upper lip, again, and placed behind the flaps above mentioned, is a square patch of stiff hairs pointing backwards and inwards, and when the flaps are brought together, as above described, are in contact with each other, and serve to diminish the size of the free opening of the inner mouth; these patches are completely isolated from all the other hairs. There

¹The genus was established for *Myopotamus coypus*—should not Kerr's name take precedence for this?

are six horizontal rows of whiskers, the central with the most bristles. There is a short series, also, over the eye and under the chin.

The thumb of the fore foot is quite rudimentary, with a distinct claw as broad at the base, but little more than half as long as the second claw. The third claw extends considerably the furthest; the fourth is a little shorter; the second and fourth claws reaching to the end of the bulb of their adjacent fingers. There are two very large tubercles at the base of the hand, nearly of equal size, separated by a deep groove; anterior to these on the palm are three others, the exterior at the bases of the second and fifth fingers; the central one between the bases of the third and fourth. The hind feet appear as if twisted slightly, the inner edge being considerably posterior to the outer, although the anterior edge of the foot is really formed by the fourth metacarpal. This arrangement enables the animal to "feather the oar," technically speaking, or bring the foot forward in swimming. The fourth claw extends rather the furthest; the third is but little shorter; the second a little shorter still; the tip of the first and fifth claws do not reach the bases of those adjacent to them. The hind claws are all short, compressed and deep, not much curved and rather blunt: the fore claws are similar but not so deep. There is one very large elongated tubercular callosity on the inner edge of the base of the metatarsals. Anterior to these, there are three quite small depressed tubercles, situated respectively at the base of the first toe, the base of the second toe, and between the bases of the fourth and fifth; none to the third toe. The under surface of all the feet is entirely naked, the skin of the hinder black and finely wrinkled, as if possessed of much tactile sensibility. All the feet have a distinct web between the basal half of the digits; their upper surface is covered with very short lustrous hairs, and the edges of the feet and digits generally, especially behind, are ciliated with close laid stiff bristly fringes.

The tail is cylindrical at the base, but almost immediately becomes greatly compressed, especially on the middle half, where it is from two to three times broader than high, the disproportion increasing posteriorly. When the tail is stretched out, the upper and lower edges are gently convex, the tip somewhat pointed; in its natural position, however, the tail is sickle-shaped, the lower edge concave. The tail can be bent into a complete circle in a vertical plane towards the belly, but is capable of but little flexion upwards and backwards. The skin of the tail is entirely black and covered with small isolated but contiguous hexagonal scales, arranged in quincunx, without any traces of annulations or whorls; at first sight it appears naked, but sparse hairs may be detected, most abundant along the upper and lower edges and the tip. The uncovered portion of the tail is nearly as long as the body without the head.

The hair is of two distinct sorts; the basal, long, silky, fine, and slightly wrinkled; this is very close and compact, especially on the belly; it is light bluish gray, except at the tips, which are light rusty brown. Interspersed among this and concealing it on the upper surface, are longer coarser hairs, which are of a rich chestnut brown on the belly and sides of head and body. The upper parts generally, from the nose to the tail, as well as the outside of the hind legs, are very dark brown or nearly black, with paler hairs intermixed anteriorly, and on the thighs; on the lower part of the back the color is uniform.

The preceding description was taken from a specimen (No. 951,) before being skinned. The following measurements were also made while the animal was fresh.

Measurements.

	No. 851.		No. 851.
	Inches.		Inches.
Nose to occiput.....	2.83	Arm, from elbow to end of claws.....	3.50
eye.....	1.30	fore foot.....	1.33
ear.....	2.75	longest claw.....	.40
root of tail.....	11.50	Leg, from knee joint to end of claws.....	5.50
naked part of tail.....	13.50	tibia.....	2.93
end of outstretched hind legs.....	17.50	hind foot from heel to end of claws.....	3.17
Tail from root to end of vertebræ.....	11.00	longest claw.....	.48
hairs.....	11.17	Skull, ¹ length.....	2.62
Uncovered portion of tail.....	9.50	width.....	1.63
Ears, height posteriorly.....	.92		
anteriorly.....	.....		
internally above skull.....	.70		
above notch.....	.83		
width.....	.80		

¹ The largest skull I have seen is No. 2300 from Washington ; this measures 2.85 inches by 1.75.

Specimens vary from the preceding description in a more fuscous character of the tips of the under fur, the reddish here sometimes nearly replaced by grayish brown, giving a much darker impression to the animal. This is more particularly the case in winter killed skins. The size is sometimes considerably greater than that described.

The well known musk rat of the United States appears to have as wide a range throughout North America as the beaver, and, unlike this species, maintains its foothold successfully against the destructiveness of mankind. It extends at the present day from the Atlantic to the Pacific, and from the Rio Grande to the barren grounds of arctic America. The species is quite abundant in Washington Territory, and appears to extend almost to the extreme north-western point of America. It was at one time supposed, indeed, that the musk rat was found on the Asiatic side of Behring's Straits ; but it appears now to be ascertained that the skins obtained from the Tschucktchis, of Kamschatka, are procured from the tribes on the American shore.

I have seen no specimens of muskrat from California ; but there is every probability of its occurring there.

Brandt mentions a dealer in St. Petersburg who possesses the art of so dressing the musk rat as to impart to it the appearance of the fur seal, both as to color and quality.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.
961	.....	♀	Middleboro', Mass.....	Oct. 1855	J. W. P. Jenks.....	.....	Skin.....
1576	2406	.....	Essex county, N. Y.....	.....	Dr. S. E. Hale.....	.....	..do.....
851	1907	♂	Saranac lake, N. Y.....	Sept. 7, 1855	S. F. Baird.....	.....	..do.....
189	.....	.....	Grosse Isle, Mich.....	.....	C. Fox.....	.....	..do.....
1902	2603	♂	Pass creek, Neb.....	Aug. 10, 1856	Lt. F. T. Bryan ¹ ...	242	..do.....
2937	.....	.....	Fort Thorne, N. M.....	.....	Dr. T. C. Henry.....	.....	..do.....
276	.....	.....	Fort Steilacoom, W. T....	Jan. 28, 1854	Gov. I. I. Stevens ² .	5	.....
2002	.....	.....	.....do.....	1856	Dr. Suckley.....	117	..do.....
.....	.....	.....	Oregon.....	.....	Dr. J. Evans.....	.....	.....

¹ Collected by W. S. Wood.² Collected by Dr. Suckley.

FAMILY.

HYSTRICIDAE.

Molar teeth, $\frac{4-4}{4-4}$; muffle, or terminal portion of the muzzle, clothed with small hairs; the skull with a large ante-orbital opening through which a portion of the masseter muscle passes as well as the infra-orbital nerve. Lower jaw with the angular portion joined to the outer (not the under) surface of the bony covering of the inferior incisors. Tibia and fibula distinct.¹

The family of *Hystricidae*, of which the porcupine is a well known example, is almost entirely American, and in fact chiefly confined to the southern portion of the continent, where most of the species of Rodents belong to it. The only Old World species belong to the genera *Hystrix*, *Aulacodus*, and *Petromys*. North America possesses but one genus, *Erethizon*, but Mexico, in addition, has *Cercolabes*, and perhaps some of the South American types may be found on its southern borders. A few species occur in the West Indies, of which *Capromys fournieri* is the most remarkable.

The family *Hystricidae*, embracing as it does so great a variety of different forms, cannot be so sharply defined as that of *Leporidae* with its two genera. Very great diversity of opinion has in fact existed as to the arrangement of the genera, many of which have been widely separated from their allies in a natural system of classification. By uniting those having the features given at the head of the article, it will be found that the forms most closely allied in reality are brought together, and an equal degree of harmony is established in the geographical distribution of the species.

The *Hystricidae*, as arranged by Waterhouse, are divisible into six sub-families, viz: *Hystri-cinae*, *Dasyproctinae*, *Echimyinae*, *Octodontinae*, *Chinchillinae*, and *Caviinae*; of these, only one, viz., *Hystricinae*, is represented in the United States by species of *Erethizon*, erroneously referred by most American authors to *Hystrix*, a genus of a different division of the sub-family. Mexico, however, has an additional genus, *Cercolabes*, belonging to the same division.

The chief characteristics of the six sub-families of *Hystricidae*, according to Waterhouse, are as follows:

I. CAVIINAE.—Molars rootless, divided by folds of enamel so as to form lobes having acute angles; the series of molars on opposite sides of the upper jaw converging and nearly meeting in front; incisor teeth comparatively short, those of the lower jaw not being extended backwards as far as the springing of the angular portion or descending ramus. Four toes to the fore feet, and three to the hind. Tail wanting, or rudimentary. Upper lip entire. A strongly developed horizontal ridge on the outer surface of the lower jaw; the angular portion of this jaw produced much beyond the condyloid portion, descending below the level of the dentary portion, and with a curved lower margin. Clavicles wanting.

The principal genera of this family are *Dolichotis*, *Cavia*, and *Hydrochoerus*, the latter, including the *Capybara*, or *Capinche*, the largest of living Rodents.

II. CHINCHILLINAE.—Molars rootless, with parallel or nearly parallel transverse plates of enamel; the series of molars on either side of each jaw converging in front. Tail long, or of moderate length, recurved and bushy. Clavicles perfect, slender. Fibula very slender. Hind feet with less than five toes.

¹Waterhouse. Nat. Hist. Mamm. II, 1848, 147.

The species of this sub-family inhabit the mountain regions of Chile and Peru, one only occurring in the plains of La Plata. They belong to the genera *Lagostomus*, *Lagidium*, and *Chinchilla*; the latter embracing the species which furnish the valuable fur called *chinchilla*.

III. OCTODONTINAE.—Molars rootless, with but a single indenting fold of enamel on either side, or rarely with an extra fold on the inner side of the molars of the lower jaw. Zygomatic arch, with an angular process on the lower edge. Hind feet with five toes; fore feet likewise with five toes, sometimes only four.

This family is readily distinguished from the other sub-families with rootless molars, *Caviinae* and *Chinchillinae*, by the possession of five well developed toes on the hind foot; the presence of a distinct tail separates it from the Cavies, while the short hairs of the same member prevent it from being confounded with the Chinchillas. The genera *Habrocoma*, *Octodon*, *Schizodon*, *Spalacopus*, and *Ctenomys*, are all confined to the middle and southern regions of South America, occurring on both sides of the Andes. Most are of small size, and some present quite a close resemblance to forms of other families. Thus *Ctenomys*, with its short tail, enormous incisors, broad depressed body, small ears, and very long fossorial claws, resembles *Geomys* most remarkably, except in wanting the external cheek pouches.

IV. ECHIMYINAE.—Molar teeth complicated and (with one or two exceptions) rooted. Malar bone with a distinct angular process on the lower edge. Both fore and hind feet with five toes.

The genera of this sub-family are *Capromys*, *Plagiodonta*, *Myopotamus*, *Cercomys*, *Petromys*, *Dactylomys*, *Loncheres*, *Mesomys*, *Echimys*, and *Aulacodus*. These are confined to South America and the West Indies, excepting *Petromys* and *Aulacodus*, which are African. The species are more numerous in this than in any other sub-family of *Hystriidae*.

V. DASYPROCTINAE.—Molars semi-rooted and arranged in parallel series. Cranium elongated; nasal bones rather short and broad; malar bones destitute of a descending process on the lower edge. A tolerably distinct post-orbital process formed chiefly by the frontal bone, but in part likewise by the squamosal. Scapula, with the emargination in the fore part of the spine, but moderately deep. Clavicles wanting. Feet formed for running, with the toes 5—3 or 5—5, terminated by sub-solid nails, which are but little arched. Tail rudimentary. Body clothed with hair only, no admixture of spines.

The two genera, *Coelogenys* and *Dasyprocta* are inhabitants of South America, ranging as far south as Paraguay and Bolivia, occurring also in some of the West India islands. The genus *Osteopera* of Harlan was founded by him on a skull picked up on the banks of the Delaware, and erroneously supposed to have floated down from the interior of Pennsylvania, where it existed as a native. It has, however, proved to belong to a *Paca*, *Coelogenys paca*, which had probably died in some menagerie and been thrown into the river.

VI. HYSTRICINAE.—Molars rooted or semi-rooted. Skull with the malar bone destitute of angular process on the lower margin. Frontal bones very broad. Feet short; the toes 5—5, 4—5, or 4—4. Body more or less armed with spines.

The species of the group as thus defined are found in both the Old and New World. Waterhouse, however, is inclined, with Brandt, to establish two main divisions of the porcupines, and even to raise them to the rank of independent sub-families. These may then bear the names of *Hystricinae* proper, and *Cercolabinae*; the former confined to the Old World, the latter to the New. The characteristics of these sections are as follows, beginning with the *Philagaee*, or

Hystricinae.—Consisting of porcupines which live on the ground and seek shelter in burrows which they themselves form. They have five toes to both the fore and hind feet. The soles are naked and smooth. The upper lip is divided by a vertical groove which runs up to join a transverse fissure which unites the nostril openings. The skull is more or less elongated and

provided with a distinct lachrymal bone which partly encloses the lachrymal foramen. The molars are semi-rooted, and arranged in parallel series; those of the upper jaw have one internal fold of enamel, and three or four folds entering from the opposite side of the tooth, but which soon assume the form of small isolated areas, disconnected with the margin of the tooth. The lower molars are like the upper, but with the enamel folds reversed. All the species are peculiar to the Old World. Genera *Hystrix* and *Atherura*.

The next section, called *Philodendreae* by Brandt, on account of the habit of living in trees possessed by the species, may be characterized as follows:

Cercolabinae.—Feet usually provided with but four toes, and these nearly equal in length, armed with long compressed curved claws; sometimes the hind foot has five toes. The soles of the feet are thickly studded with minute depressed warts. The upper lip not divided by a vertical groove. The skull is short and broad, provided with a minute lachrymal bone, which forms no part of the lachrymal canal; the portion of the palate which lies between the molars is distinctly on a lower level than the anterior portion, and the bony partition which separates the incisive openings, (being part of the intermaxillaries,) runs back above the palatal portion of the superior maxillary bones; whilst in the Old World porcupines the incisive septum joins the superior maxillary by a serrated suture, and is continuous with the plane of the palate, which latter is throughout on the same level. (Distinct anterior and posterior clinoid processes bound the pituitary depression in the skulls of the Old World porcupines, but are wanting in the New World species.) The series of molar teeth of opposite sides of the jaw converge in front; these teeth are distinctly rooted. Each molar has a distinct fold of enamel on either side, and the crown, when but little worn, presents a deep transverse cavity, surrounded by enamel on each of the two lobes, which are separated by the enamel folds. Incisor teeth small. To this division belong the genera *Erethizon*, *Cercolabes*, and *Chaetomys*, the latter differing considerably in the structure of its molars from the others.

ERETHIZON, F. Cuvier.

Erethizon, F. CUVIER, Mém. du Mus. IX, 1822, 426, 432.

For the principal characters of the skull and teeth, I would refer to the diagnosis of the family *Hystriidae* and sub-family *Cercolabinae*. In distinction from *Cercolabes*, the tail is short, thick and depressed; covered above at the base with hairs and spines, at the apex and on the under surface with stiff bristles. Nostrils closely approximated. Feet short and broad. Toes (4, 5,) all armed with long and curved claws.

The genus *Erethizon* is confined to North America, extending, perhaps, into Mexico on the south, and ranging to the parallel of 67° on the north, and from the Atlantic to the Pacific. It is very closely allied to the South American and Mexican *Cercolabes*, but is readily distinguished by the much shorter and stouter tail, which is well covered with hairs and spines, and is incapable of prehension. The nostrils are more approximated, being separated by an extremely narrow partition. The anterior molar is usually considerably larger than all the others.

The hind feet differ in having a distinct inner toe, which is armed with a large claw; the feet lack the projecting semi-circular lobe on the inner side, seen in *Cercolabes*. The naked soles are covered with minute tubercles. The upper lip is slightly notched above the incisor teeth, but there is no dividing groove, or naked mesial line, as in the Old World porcupines; even the narrow septum between the nostrils is not destitute of hairs. The body is stout, and covered on the upper parts with a long and dense fur, which hides the spines. The limbs are short and strong.

The most important differences between *Erethizon* and *Hystrix* will be found detailed in the characters of the sub-families to which they respectively belong.

ERETHIZON DORSATUS.

White Haired Porcupine.

Hystrix dorsata, LINN. Syst. Nat. (ed. 10) i, 1758, 57.—Ib. (ed. 12) I, 1766, 76.

ERXLEBEN, Syst. 1777, 345.

BODDAERT, El. Anim. I, 1784, 128, (from Pennant.)

GMELIN, Syst. Nat. I. 1788, 119.

SCHREBER, Säugt. IV, 1792, 605; tab. clxix.

SHAW, Gen. Zool. Mamm. II, 1801, 13; pl. cxxv.

KUHL, Beiträge, 1820, 70.

DESMAREST, Mamm. II, 1822, 345.

COZZENS, Ann. N. Y. Lyc. I, 1, 1823, 191, (habits.)

HARLAN, F. Am. 1825, 190.

GRIFF. Cuv. III, 127, 206, original fig.—Ib. V, 1827, 263.

FISCHER, Synopsis, 1829, 368.

AUD. & BACH. N. Am. Quad. I, 1849, 278; pl. xxxvi.

Erethizon dorsatus, F. Cuv. Mém. du Mus. IX, 1822, 432; tab. xx, f. 1, 2.—*IB.* Dict. des. Sc. Nat. XLII, 531.

BRANDT, Mém. Acad. St. Petersburg. 1835, 387.

WATERHOUSE, N. H. Mammalia, II, 1848, 27.

GIEBEL, Säugt. 1855, 478.

Erethizon dorsata, WAGNER, Suppl. Schreb. IV, 1844, 27.

Hystrix pilosus, (CATESBY,) RICH. F. B. Am. I, 1829, 214.

DOUGHTY'S Cab. N. H. I, 1830, 241; pl. xxi.

Hystrix hudsonius, (BRISSON,) DEKAY, N. Y. Zool. I, 1842, 77; pl. xxvi, f. 1; pl. viii, f. 2, a, b, c, (skull.)

Porc épie de la Baie de Hudson, BRISSON, R. A. Quad. 1756, 128.

Canada porcupine, PENNANT, SYN. 1771, 266.—*IB.* Hist. Quad. 1781, No. 257.—*IB.* Arctic Zool. I, 1784, 109, (sp. in Leverian museum.)

Porcupine; *Canada porcupine*; *hedgehog*; VULGO.

SP. CH.—Fur, dark brown; the long projecting bristly hairs, dusky, with white tips; spines white, the points dusky. Nasal bones not more than one-third the length of the upper surface of the skull.

I regret not to have a sufficiently perfect specimen of the common eastern porcupine before me to furnish a satisfactory description. The differences, however, from the *E. epixanthus* are not very great, consisting chiefly in the color of the tips of the long hairs, and one description will answer very well for both, except where the peculiarities of each are specially indicated.

The range of this species is much more limited than previously supposed, as it is replaced west of the Missouri by the *E. epixanthus*. It is found as far south as northern Pennsylvania, in some localities, in which State it is not rare even now. Northward it reaches to the Barren Grounds.

For an elaborate and very satisfactory account of the porcupine, both as to its external features and its habits, I would refer to the article in the Quadrupeds of America by Messrs. Audubon and Bachman.

List of specimen.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence obtained.	Nature of specimen.
38	931	St. Lawrence county, N. Y.	Dr. F. B. Hough	Skin

ERETHIZON EPIXANTHUS, Brandt.

Yellow-haired Porcupine.

Erethizon epixanthus, BRANDT, Mém. Acad. St. Petersburg, 1835, 389, 416; table i, Animal; table ix, fig. 1—4,

Skull.—*IB.* Mamm. exot. 55, (same as preceding.)

SCHINZ, Synopsis Mamm. II, 1845, 266.

WATERHOUSE, N. H. Mamm. II, 1848, 442.

SP. CH.—General color dark brown, nearly black; the long hairs of the body tipped with greenish yellow. Nasal bones nearly one half or two-fifths the length of upper surface of the skull.

This animal is of large size, almost equal to the beaver. As usual in the porcupines, the

¹ The *Erethizon buffoni* of F. Cuv., based on the Coendou of Buffon, is supposed to be merely a Canada porcupine, with the quills exposed by the absence of the long hairs, as is frequently the case.

muffle is entirely hairy. There are but four fingers on the fore feet, without any rudiment of a thumb; the palms are sub-quadrate, longer than broad; flat, and closely granular—tuberculate. They are divided by a transverse fissure from the fingers, which are likewise naked beneath. The soles are plantigrade, very broad; the surface of the sole, like that of the palm, plane, without any prominent tubercles, but covered with a pavement of depressed granulations, resembling very much that of a bear in general appearance; it is about $1\frac{1}{2}$ inch wide, by $2\frac{1}{2}$ long. This is separated by a furrow from the toes, the bases of which are hairy beneath, but naked towards the balls; even these appear hairy from the overlapping of the long bristles of the side. The first toe is very short, the remaining four appear of nearly equal length. The claws of all the feet are very long, nearly equal; the posterior stoutest. The tail is short, very thick, and much depressed.

The animal is covered on the upper parts and sides with a dense growth of short spines. These become thinner and thinner, till on the lower part of the sides they pass through thickened spinous hairs, to coarse bristly hairs. On the middle of the belly there are no spines at all, nor on the lower part of the limbs. The muzzle is also free from them.

The under fur of this species is rather soft and of a dark sooty brown, nearly black, much like the hair of the black bear. This is, however, mostly concealed by long bristles, six to eight inches long, the tips of which are of a greenish yellow. The concealed portion is dark brown, except the extreme base, which is whitish. The proportion of light and dark varies with the hair and the specimen. The central line of the belly is sooty brown, lighter than above. The limbs also are brownish, where not covered with spines, with their inner surfaces tinged with ashy. The spines are yellowish on the back, whitish on the sides, tipped with brown.

There are certain peculiarities in the skull of this species, as compared with that of *E. dorsatus*, which appear to be constant, at least as far as the specimens before me go. The chief of these is the great size of the nasal bones. These are of nearly uniform width throughout, the sides nearly parallel, except that at about the posterior third they are wedged in between the frontals, the two forming an acute angle, projecting back as far as the eye-ball. This length of the bone is always two-fifths of the upper surface of the skull, sometimes even more. This character is well shown in Brandt's figure.

In *E. dorsatus*, the nasals begin to narrow almost from the anterior extremity, and do not extend as far between the frontals. Their length is rather less than one-third that of the upper line of the skull, or, at most, not exceeding one-third.

In both species, the anterior molar of both jaws is considerably larger than the rest.

The following table will illustrate the peculiarities of the nasals above referred to :

Current number.	Species.	Skull from occiput to end of incisors.	Skull from occiput to end of nasals.	Width of skull.	Length of nasals together.	Greatest width of nasals together.	Locality.
822	<i>E. epixanthus</i>	3.83	3.57	2.82	1.40	.90	Upper Missouri.....
1263	do.....	3.70	3.48	2.55	1.40	.76	Bill Williams' Fork.....
1262	do.....	3.40	3.15	2.37	1.25	.68	do.....
2594	do.....	4.23	3.95	2.85	1.60	.80	Republican Fork.....
2595	do.....	4.23	4.00	2.85	1.80	.96	do.....
931	<i>E. dorsatus</i>				1.08	.65	St. Lawrence county, N. Y.....
676	do.....	3.58	3.35	2.55	1.20	.65	Pennsylvania.....
2356	do.....	3.90	3.70	2.75	1.30	.76	Essex county, N. Y.....
3066	do.....	4.35	3.75	2.90	1.21	.78	do.....

This species was first separated from the common American porcupine, by Brandt, in 1835. It appears well worthy of specific distinction. Brandt's specimens came from California and Unalashka. This will give a wide range to the species, as it probably replaces *E. dorsatus* everywhere, from the Upper Missouri, north and west.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	
.....	822	.....	Fort Union, Neb.....	.....	T. Culbertson ..	.....	Skeleton	.....	.....	.....	.....	.....
1896	2594	.....	Republican Fork.....	Oct. 6, 1856	Lt. F. T. Bryan.....	370	Skin ¹ ...	6.50	26.00	6.50	8.75	W. S. Wood
1897	2595	♂	do	Oct. 7, 1856	do	371	Skin ¹ ...	6.75	25.75	7.00	8.50	do
348	1262	.....	Bill Williams' Fork, N. M.	1854	Capt. A. W. Whipple..	.....	Mounted	.....	.....	.....	.....	Dr. Kennerly and H. B. Möllhausen.
349	1263	.....	.....do	1854	do .....	.....	do .....	.....	.....	.....	.....	.....
1189	.....	.....	Fort Reading, Cal.....	.....	Lt. Williamson.....	.....	Skin .....	.....	.....	.....	.....	Dr. J. S. Newberry. .

¹ Measurements taken before skinning.

FAMILY.

LEPORIDAE.

Incisors $\frac{4}{4}$, molars $\frac{6-6}{5-6}$ or $\frac{5-5}{6-6}$, rootless. Skull with the two optic foramina united.

The general characteristics of the *Leporidae* have already been adverted to in the remarks upon the Rodentia. The following more detailed remarks, from Waterhouse,¹ will serve to complete the diagnosis of the family.

“Openings of the skull large; palate, imperfect; nasal processes of the superior maxillary bone perforated; orbits very large, meeting in the mesial line of the cranium; temporal fossae small. Incisors and molars more numerous than in any other rodents. The extra pair of incisors in the upper jaw is small and placed behind the principal pair, which is grooved in front. All the incisors are less deeply implanted in the jaws than in other rodents and are always white. The molars are always rootless.

“The stomach is simple or partially divided internally; the coecum, which is very long, is divided into numerous cells by tendinous bands, the partitions being indicated externally by a corresponding number of constrictions; similar constrictions are discernable on the first part of the colon, but this soon contracts to a diameter which is nearly equal to that of the small intestines. At the point of junction of these latter with the coecum is a small glandular cul de sac.

“The spine of the shoulder blade or scapula terminates in a moderately long acromion process, which, near its extremity, sends down a long branch at right angles with the spine. The fore feet are provided with five well developed toes, the hind feet with four. At the lower half of the shank the two bones (tibia and fibula) are always anchylosed.

“The inner surface of the cheeks is clothed with small hairs; at least there is a moderately broad band of skin which is thus clothed, running backward from the angle of the mouth. The tail is rather short and bushy, and carried erect or exists only in a rudimentary condition.”

Species of this family are found distributed in most quarters of the globe, but are most abundant in North America.

The family contains but two genera, *Lepus* and *Lagomys*, the former with six, the latter with five upper molars.²

¹ Natural History of the Mammalia, II. 1848-9.

² The generalities respecting this family have been derived chiefly from the admirable work of Waterhouse, as quoted above.

LEPUS, Linn.

Lepus, LINNAEUS, "Syst. Nat. 1735."

Molars, $\frac{6-6}{5-5}$; ears large, nearly as long or longer than the head; tail short and bushy; hind legs powerful, and much longer than the fore legs.

The hares are distinguished by the above characteristics essentially from the Pikas (*Lagomys*), to which others, derived from the shape of the skull, as mentioned under *Lagomys*, may be added. About twenty species are considered by Waterhouse as well established for the Old World; not quite so many in North America. This continent does not appear to possess any genuine rabbits like the European *L. cuniculus*, characterized by living gregariously and constructing burrows in which the young are raised, while the hares proper are more or less solitary, and merely make nests or forms of grass on the surface in which they sit. The young rabbits are born blind and naked, while the hares are said to have the eyes open and the body covered with hair at birth. Waterhouse points out some differences in the osteological structure of the European rabbit and common hare, but he does not show that these are other than specific, or whether the peculiarities of either are shared or not by any other species. As before stated, there do not appear to be any true rabbits in North America; nor, indeed, are authors clear as to whether the habits and peculiarities of *Lepus cuniculus* are shared by any other species of Old World *Lepus*.

I have omitted any generalities respecting the skeleton, skull, and teeth of *Lepus*, as these have been given by Waterhouse in a much more detailed and comprehensive manner than my time and ability will allow. In the examination, however, of large series of skulls of the American and European hares, I have detected certain characteristics which exhibit quite a remarkable relation to the different groups into which they are divisible, as based on the proportions of the feet and ears. These refer chiefly to the absolute size of the skull, as compared with the body; its proportions and curvature above; but most particularly to the character of the post-orbital process of the frontal bone. Thus, in the varying hares of Europe and America, including *Lepus timidus*, in addition to *L. variabilis*, var. *borealis*, *glacialis*, *americanus*, *washingtonii*, and *campestris*, the skull is very broad, the width being very nearly, if not quite, one-half the length. The muzzle anterior to the molars is higher than wide. The upper outline is much curved, especially posteriorly. The post-orbital processes of the frontal bone have their exterior borders strongly divergent behind, so that they would meet if produced anteriorly considerably within the end of the suture of the nasal bones. The divergence of their posterior border is still greater, and the process itself does not come in contact with the cranium behind, but bounds a wide notch.

In the next section, composed of *L. californicus* and *callotis*, the skull is much narrower, the width considerably less than half the length. The muzzle anterior to the molars is wider than high. The nasal bones are longer; the upper outline less curved. The exterior borders of the post-orbital processes are nearly parallel; the postero-internal less divergent. The process usually extends back so as to come in contact, by its truncated extremity, with the cranium, but there is seldom any ankylosis, and quite frequently there is a slight interval. When in contact, the

process forms the outer margin of an elongated foramen, the anterior extremity notching widely the frontal bone.

The skull of *Lepus cuniculus* forms a sort of connexion between these two groups. In this the post-orbital processes are widely divergent, and bound notches; the muzzle is very slender in all diameters, and much elongated; the width greater than the height. The nasal bones are very long. Compared with the skull of *L. americanus*, of nearly the same length, the muzzle is little more than three-fourths as high just anterior to the molars; the nasal bones one-fifth longer. The incisors are larger.

The next section embraces *L. sylvaticus*, *bachmani*, and *artemisiae*. Here the width of the skull is again almost half the length. The cranial portion of the skull is short, in comparison with the facial; its upper outline is very convex, especially in the portion occupied by the parietal bones; the posterior projection of the occipital bone is much below the level it exhibits in the other groups. The muzzle anterior to the molars is wider than high. The post-orbital process of the frontal bone is linear, and, projecting backwards, becomes ankylosed by its tip and terminal portion of the inner edge with the cranium (the suture visible, however); there is left a narrow, ovate foramen at the basal half or third of the process, the space enclosed not being quite filled up. *Lepus auduboni* differs only in having a very narrow interval between the posterior extremity of the post-orbital process, leaving a narrow notch instead of a foramen.

Lepus trowbridgii differs still more in having the post-orbital process shorter and more divergent, so that the notch is more conspicuous, somewhat as in the first form mentioned.

The remaining section, embracing *L. aquaticus* and *palustris*, is most remarkable of all. Here the skull and incisors are much larger in proportion to the body (the latter especially) than in any others. The skull is narrow; the width, considerably less than half the length. The incisors of a skull of *L. aquaticus*, an animal apparently not heavier than *L. americanus*, exceed those of any I have ever seen, excepting one very large *Lepus timidus*. Another striking peculiarity is the entire fusion of the postero-internal margin of the post-orbital process of the parietal bone with the cranium so completely that the suture is not even visible. There is, therefore, neither notch, nor foramen, though the latter is indicated by a fossa. In one or two cases there is a small perforation in this fossa, but very different in character from the foramina of the other groups.

In addition to these prominent points of difference, there are some others: such as the shape of the lower jaw, the shape and size of the superior outline of the occipital bone, &c. I have, however, said enough to indicate the general fact of a relationship between peculiarities of skull and external form. The principal features, however, as described, will be brought out more prominently by the following synopsis and table of measurements of sixteen species:

A. Skull very broad and high; much curved; the muzzle short; higher than wide, anterior to the molars.

Post-orbital processes very large, widely divergent; bounding a wide notch.....	<i>L. timidus.</i>
	<i>borealis.</i>
	<i>glacialis.</i>
	<i>americanus.</i>
	<i>washingtonii.</i>
	<i>campestris.</i>

B Skull narrower; less curved above; muzzle wider than high. Post-orbital processes very large, more parallel; the posterior extremities nearly or quite in contact with the skull, but without complete fusion; the foramen enclosed, long and wide.....

L. californicus.
callotis.

- C. Skull more than twice as long as wide; muzzle and nasal bones very long; the former wider than high, anterior to the molars; post-orbital processes divergent; not in contact behind with the skull *L. cuniculus*.
- D. Skull about twice as long as wide; very convex and much arched behind. Muzzle rather wider than high, post-orbital processes moderate; united behind by ankylosis with the skull, (suture distinct,) and bounding a small narrow foramen anteriorly..... *L. sylvaticus*.
bachmani.
artemesia.
- E. Similar to preceding; the post-orbital process not in contact with the cranium..... *L. trowbridgii*.
auduboni.
- F. Skull and incisors very large and massive; muzzle about as wide as high. Post-orbital process completely fused with the skull for its entire length, leaving neither foramen, notch, nor suture..... *L. aquaticus*.
palustris.

Comparative measurements of skulls.¹

Current number.	Name of species.	Skull.		Distance between—			Nasal bones, taken together.		Locality.
		Length.	Width.	Extreme edges of orbital processes.	Bottom of posterior supra-orbital notches.	The last mentioned and end of nasal.	Length.	Width.	
1857	<i>L. timidus</i> , L.....	4.03	1.97	1.60	.63	2.50	1.75	.93	Germany.
1048	<i>L. variabilis</i> , var. <i>borealis</i> , Nilss.....	3.61	1.81	1.36	.64	2.07	1.34	.78	Sweden.
2277	<i>L. glacialis</i> , Leach.....	3.65	1.85	1.34	.65	2.12	1.48	.80	Newfoundland.
1670	<i>L. americanus</i> , Erxl.....	3.34	1.61	1.12	.48	2.01	1.35	.75	New York.
2158	<i>L. cuniculus</i> , L.....	3.45	1.62	1.01	.45	2.04	1.55	.66	Washington, D. C.
3227	<i>L. californicus</i> , Gray.....	4.00	1.75	1.23	.43	2.35	1.80	.87	San Francisco, California.
1260	<i>L. callotis</i> ? Wagl.....	3.80	1.75	1.14	.52	2.17	1.65	.82	Fort Conrad, New Mexico.
1215	<i>L. callotis</i> , var. <i>flavicularis</i> ? Wagn.....	3.75	1.75	.....	.52	2.04	1.53	.85	Western Texas.
1352	<i>L. campestris</i> , Bach.....	3.67	1.76	1.22	.55	2.25	1.60	.83	Fort Kearney, Nebraska.
1223	<i>L. washingtonii</i> , Baird.....	2.93	1.50	.94	.48	1.67	1.15	.66	Washington Territory.
595	<i>L. cuniculus</i> and <i>sylvaticus</i> , hybrid*.....	2.95	1.45	.90	.50	1.71	1.20	.50	Carlisle, Pennsylvania.
2093	<i>L. sylvaticus</i> , Bach.....	2.95	1.44	.90	.52	1.80	1.15	.50	Do.
2094	do.....	.....	1.54	1.05	.48	1.86	1.33	.65	Fort Des Moines, Iowa.
1232	<i>L. artemesia</i>	2.60	1.35	.93	.43	1.55	1.10	.55	West of San Antonio, Texas.
1193	<i>L. bachmani</i> , Waterh.....	2.70	1.34	.95	.43	1.70	1.15	.50	Brownsville, Texas.
2041	<i>L. auduboni</i> , Baird.....	2.66	1.34	.90	.48	1.57	1.10	.55	San Francisco, California.
1871	<i>L. trowbridgii</i> , Baird.....	2.52	1.25	.70	.44	1.50	1.12	.44	Do.
2089	<i>L. palustris</i> , Bach.....	3.20	1.50	1.04	.....	1.98	1.20	.46	Society Hill, South Carolina.
1228	<i>L. aquaticus</i> , Bach.....	3.55	1.63	1.10	.....	2.17	1.48	.65	Calcasieu, Louisiana.

¹ The measurement of length is taken with dividers, from the transverse occipital crest to the anterior face of upper incisors in most cases; to the end of the nasals, the distance is somewhat less in some, though not in all.

* This skull belonged to a hybrid of the second generation, between *L. cuniculus* and *sylvaticus*, and exhibits in a marked degree the cranial peculiarities of both species. Thus, we have the rather short muzzle and nasal bones, with the rounded and arched cranium proper of the latter, and the divergent and free post-orbital processes of the former.

The following synoptical arrangement may serve to facilitate the determination of our species of hares :

A.—SKULL WITH DISTINCT POST-ORBITAL PROCESSES.

a. *Hind feet considerably longer than the head; size of body large.*

I. Post-orbital processes widely divergent, bounding a notch. The American species change to white in winter.

Ears about as long as the head, or less. Tail short.

1. Very large. In summer, sooty yellowish gray. Ears with black tip on both surfaces. In winter, fur pure white to roots *L. glacialis.*
2. In summer, cinnamon brown. Tail sooty above. Ears with most of dorsal surface whitish. Winter under fur lead colored at base, then brownish red..... *L. americanus.*
3. Smaller. In summer, rich cinnamon. Tail brownish above. Ears with dorsal surface, light cinnamon, and with a good deal of black. Pads of the toes abruptly lighter than those of the metatarsus..... *L. washingtonii.*

Ears considerably longer than the head; tail long.

4. In summer, yellowish brown gray. Tail white on both surfaces; as long as the head. Winter, under fur white at the base, then reddish..... *L. campestris.*

II. Post orbital processes divergent, but in contact behind by their extremities with the cranium. Tail black above, this color running up on the rump.

5. Above, yellowish gray and black; rump ashy; tail and body beneath, whitish..... *L. callotis.*
6. Above, cinnamon, red, and black; rump not dissimilar. Under surface of tail and body light cinnamon..... *L. californicus.*

b. *Hind feet nearly the length of the head. Size medium; inner edge of post-orbital processes united behind and laterally by suture with the cranium.*

I. Soles very densely furred; fur on back, with two yellowish subterminal brown bars, enclosing a dusky one. Tail two-thirds as long as the ear.

7. Skull nearly 3 inches long. Ears shorter than the head. Above, yellowish brown, with a tinge of reddish..... *L. sylvaticus.*
8. Smaller. Skull about 2.65 inches long. Ears as long as the head. Above, grayish yellowish brown..... *L. artemisia.*

II. Soles rather scantily furred; fur on back, with only one yellowish brown bar, external to a blackish one.

9. Tail very short; scarcely half the length of the ear..... *L. bachmanii.*

c. *Hind feet apparently shorter than the head. Post-orbital processes scarcely in contact with the cranium behind.*

Ears nearly as long or longer than the head.

10. Tail long. Fur on back, with only one yellowish brown subterminal bar. *L. audubonii.*
11. Tail very short. Fur on back, with two subterminal yellowish brown bars enclosing a dusky one..... *L. trowbridgii.*

B.—SKULL WITHOUT ANY POST-ORBITAL PROCESS.

Post-orbital processes so fused in the frontals as not to exhibit a suture. Feet very short; fur very scanty, exposing the toes.

- | | |
|---|----------------------|
| 12. Tail long, pure white beneath..... | <i>L. aquaticus.</i> |
| 13. Size much less. Tail very short; dull brownish white beneath..... | <i>L. palustris.</i> |

LEPUS GLACIALIS, Leach.

Polar Hare.

Lepus glacialis, LEACH, "Ross' Voyage, 8vo, II, 1819, App. iv, 170."

ED. SABINE, App. Narr. Franklin's Journey, 1823, 664.—*Is.* App. Parry's First Voyage, 1824, 187.

RICH. App. Parry's Second Voyage, 1825, 321.—*Is.* F. Bor. Am. I, 1829, 221.

HARLAN, F. Am. 1825, 194.

GRIFF. Cuv. V., 1827, 265.

FISCHER, Synopsis, 1829, 373.

J. C. ROSS, in App. J. Ross' Narr. 1835.

BACHMAN, J. A. N. S. Phila. VII, II, 1837, 285; pl. xxi.—*Is.* VIII, I, 1839, 76.

WAGNER, in Schreb. Säugt. IV; pl. cccxxv. D. (original figure. No text.)—*Is.* Supplement Schreiber, IV. 1844, 101.

WATERHOUSE, Nat. Hist. Mamm. II, 1848, 102.

AUD. & BACH. N. Am. Quad. I, 1849, 242; pl. xxxii.

Lepus timidus, FABR. Fauna Groenl. 1780, 25.

"*L. arcticus*, LEACH, Ross' Voyage, II, 1819, App. 151." ¹

Varying hare, PENNANT, Hist. Quad. 1781, No. 242.—*Is.* Arctic Zoology, I, 1784, 94, (in part.)

SP. CH.—Size very large; exceeding a large cat. Ears about four-fifths the length of the head. Hind foot considerably longer than the head. Color in winter, pure white to the roots of the hairs; the ears, however, black at the extreme tip on both surfaces. In summer, yellow-brownish gray above, varied with black; rump and upper surface of tail sooty plumbeous; under parts whitish, everywhere with a strong sooty tinge. Ear almost uniform glossy black, with the posterior margin-whitish; the membrane dark brown.

This species is among the largest, if not the largest, of the varying hares, not only of this country, but of Europe. The ears and legs, however, are far from assuming the dimensions of the more southern Texas and California species.

Taking an adult in winter as the type, the head is much arched and broad. The ears are about four-fifths the length of the head; they are broad, ovate; the membrane somewhat rounded, but appearing more pointed on account of the hair. They are closely covered with hair on both sides, except towards the bottom of the concavity, which is nearly naked. The tail is rather short, and so densely covered with hair as to be appreciable only on close examination. The under surfaces of the feet are densely furred, so much so as very nearly to conceal the nails, which are nearly black. The fur is very full, soft, and fine all over the body.

The color of this species in winter is a pure white to the very base of the hairs; the brushy fur on the under surfaces of the feet only being of a dirty yellowish white. The edges of the orbit, the eyelashes, the nails, and the membrane of the ear are black; there is a triangular patch

¹ I have not this work at hand to ascertain why the name of *arcticus* should not be retained, as taking precedence in the paging of the same work.

of black on the extreme tip of the ear, on both surfaces, about three-quarters of an inch long and about as wide.

A spring specimen, 355, about changing, has the fur as if soiled with yellowish. The new summer fur is making its appearance in irregular patches of a brownish gray, washed with dirty yellowish, almost precisely as in *Lepus campestris*. The under fur is a dirty white at the base, with rather a more brownish tinge towards the tip; the long bristle hairs are black, lighter at the base, and with a subterminal annulation of grayish.

In a young summer specimen the prevailing color is a mixed yellow-brownish gray and black, with, however, a strong plumbeous sooty tinge, which is very distinct in the fur of the sides and belly, where the bristle hairs are wanting. The rump is very decided sooty plumbeous, this color extending narrowly along the upper side of the tail, which elsewhere is a dirty sooty white. The exterior of the hind legs is tinged with sooty, of the fore legs with yellowish brown. The pads of the feet are dusky yellowish brown; the anterior faces of the hind legs whitish. The ears are entirely of a glossy black, mixed a little anteriorly at the base with yellowish brown; the extreme posterior edge is whitish. The under fur is as described in the preceding specimen.

A winter skin from Greenland appears to have shorter feet and ears; the former more densely furred. The black tip to the ears is only barely visible.

I cannot find any character by which to distinguish the *Lepus glacialis* and *L. variabilis* of Europe when in their winter fur. The summer dress, comparing the young Newfoundland skin with one of *L. variabilis* var. *borealis*, from near Stockholm, is also much the same in both. The ears of the former, however, are much more intensely black. The whitish under fur above is less reddish; the tips or subterminal annulations of the coarse hairs are more gray instead of being of a reddish brown. The head has less of a cinnamon tinge. The resemblance is, however, certainly very close both in size and proportions, and with the difference indicated, both have the sooty on the rump and upper surface of the tail, the sooty tinge to the pectoral band, &c. In the American animal the sooty tinge extends to the extremity of the chin instead of this being rather whitish.

Winter specimens of *L. variabilis*, from the Highlands of Scotland, appear to have disproportionately smaller ears than those from Sweden, of either of the varieties, *canescens* or *borealis*.

The skull of this species is very similar to that of *L. variabilis* of Europe; so much so as to render it very difficult to discern any difference in the specimens before me. It is much broader, shorter, and more curved than in *L. californicus* or *callotis*; it is considerably longer behind the post orbital notches than in *L. Americanus*.

The polar hare is peculiar to the arctic portions of the American continent, the island of Newfoundland, where it is quite abundant, being its southern limit. Its western boundary is not known, though it probably extends across to Behring's Straits. It is also an inhabitant of Greenland.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								
						Nose to eye.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Ear, anteriorly.	Ear, from notch.
1030	.....	Greenland.....	Winter.....	S. Steenberg	Skin	2.20	5.00	25.00	2.00	3.20	2.50	5.60	3.85	3.20
353	.....	Newfoundland.....	Early spring...	J. G. Bell.....	Mounted....	2.30	.....	23.00	.....	.....	.....	6.40	3.90	3.80
1356	.....	.....do.	Summer.....	J. Downes.....	Skin .....	.....	.....	.....	.....	.....	.....	5.90	3.80	3.30
1557	.....	.....do.	Winter.....	Dr. J. M. Skues ¹ ..	do.....	.....	5.00	20.00	2.00	4.00	3.10	6.20	4.20	3.40
1194	2276	do.	do.	do.	Head in alc. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1195	2277	dd.	do.	do.	do.....do. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....

¹ Longest claw of fore and hind feet, .60.

LEPUS AMERICANUS, Erxl.

Northern Hare. White Rabbit.

Lepus americanus, ERXLEBEN, Syst. 1777, 330. (From Forster & Pennant)

GMELIN, Syst. Nat. I, 1788, 162.

SHAW, Gen. Zool. Mamm. II, 1801, 202.

RICHARDSON, App. Parry's 2d Voyage, 1825, 324.—IB. F. Bor. Am. I, 1829, 217.

BACHMAN, J. A. N. Sc. Ph. VII, 1837, 403.—IB. VIII, I, 1839, 76.

DEKAY, N. Y. Zool. I, 1842, 95; pl. xxvi, f. 2.

WAGNER, Suppl. Schreb. IV, 1844, 104.

WATERHOUSE, N. H. Mamm. II, 1848, 108.

AUD. & BACH. N. Am. Quad. I, 1849, 93; pl. xi, xii.

Lepus hudsonius, PALLAS, Glires, 1778, 30.

BODDAERT, Elenchus Anim. I, 1784, 99.

ZIMMERMANN, Pennant's Arktische Zool. I, 1787, 96.

Lepus nanus, SCHREBER, Säugt. II, 1792, 881. (In part only, the figure pl. ccxxxiv, B. appears to be *L. sylvaticus*.)*Lepus virginianus*, HARLAN, F. Am. 1825, 196.

FISCHER, Synopsis, 1829.

DOUGHTY's Cab. N. H. I, 1830, 217; pl. xix.

BACHMAN, J. A. N. Sc. Phil. VII, 1837, 301.—IB. VIII, 1839, 76.

THOMPSON, N. H. Vermont, 1842, 48.

Lepus variabilis, var. *virginianus*, GODMAN, Am. N. H. II, 164.*Lepus borealis*, SCHINZ, Synopsis II, 1845, 286.*American Hare*, FORSTER, Phil. Trans. LXII, 376.

PENNANT, Hist. Quad. 1781, No. 243.—IB. Arctic Zool. I, 1784, 95.

Hudson's Bay Quadruped, BARRINGTON, Phil. Trans. LXII, 11.

SP. CH.—Larger than the common gray rabbit. Ears about the length of the head. Hind foot much longer. Tail short. Color, in summer, very similar to that of the European hare; rich reddish or cinnamon brown above; tail sooty brown above, dull grayish beneath; body beneath white; ears black at the tip of the dorsal surface, this extending down the margins; the fringe and posterior edge white.

In winter, white, though usually showing a good deal of yellowish brown between the tip of the long hairs; the under fur plumbeous from the roots for the basal half, then brownish red. Ears white, except the external band.

This species, the smallest, as far as known, of those that become white in winter, with the exception, perhaps, of *L. washingtonii*, has the ears decidedly shorter than the head, in the skin, though sometimes even a little longer when fresh; the body slender, and the limbs elongated. The ears are naked for a portion of their concavity, elsewhere thickly furred; thinner on their convexity. The tail is rather short.

Winter pelage. (No. 67.) A specimen in winter fur, from northern Pennsylvania, is everywhere white, with a shade of yellowish; the concealed darker colors of the body of the hairs showing through in places where the fur is parted. The under surfaces of the feet are deeper yellowish. The ears are white, with the distal half of the external band mixed reddish yellow and white; the upper part of the posterior margin dark brown; the edge of the ear more white. The fur on the upper part and sides is light plumbeous for the basal half, (paler at the extreme base,) then pale brownish red or cinnamon, and tipped with white; mixed with this fur are stiffer and longer hairs, of pure white. In passing round to the lower part of the sides, the reddish fades out until on the belly it disappears entirely, and the white tips invade the lead color almost to the disappearance of the latter.

In a very richly colored specimen of this species, from Middleboro', Massachusetts, the prevailing color above is a rich reddish brown, or cinnamon chestnut, on the upper parts, sides, and across the throat. On the back, the black tips to the hair relieve the chestnut. The region around the eye is not appreciably lighter. The ears show a good deal of white, especially on the inner band, and on the dorsal surface. The outer band is like the back. The fringe of the ear and the posterior edge are almost white. There is a very narrow border of black on the end of the ear, extending about half way round posteriorly, and one-fourth anteriorly; the black is more extended over the ear at the tip, though confined throughout to the convexity or inner surface. The tail is sooty brown, almost black above, (the color not extending on the rump,) and dull grayish white beneath.

Some specimens have a decided tinge of yellow in the chestnut. The under surfaces of the feet are snuff brown. The under fur is bluish gray for the basal half above; beneath, it is entirely white.

The colors of this species are very similar to those of the European hare, *Lepus timidus*, although the hairs on the back are plumbeous at the base instead of silky white. The long hairs are reddish brown towards the end, with a black tip, instead of having the tip reddish brown with a broad subterminal annulus of black.

Somewhat similarly colored to the *L. californicus*, this species lacks the very long ears, the long black tail and black line on the rump, and the cinnamon under parts. The hind feet are actually longer, though the animal is smaller, while the ears and fore feet are much smaller. In fact, in these respects, as well as in the peculiarities of coloration of the fur above, the differences are somewhat as mentioned in regard to *L. timidus*.

Measurements from fresh specimens.

	No. 316.	No. 317.
	<i>Inches.</i>	<i>Inches.</i>
Nose to occiput.....	3.50	3.25
eye.....	1.66	1.58
ear.....	3.17	3.00
root of tail.....	19.50	16.00
end of outstretched hind legs.....	28.25	25.84
Tail, from root to end of vertebræ.....	1.58	1.33
hairs.....	2.42	1.75
Ears, height, posteriorly.....	3.58	3.42
anteriorly.....	3.33	3.08
internally above skull.....	3.00	2.84
width.....	2.00	1.75
Arm, between claws, across shoulders.....	21.00	19.75
length of fore arm.....	3.58	3.08
from elbow to end of claws.....	6.08	5.50
from fore foot to end of claws.....	2.50	2.58
longest claw.....	.33	.33
Leg, from knee joint to end of claws.....	10.25	8.50
tibia.....	5.42	4.58
hind foot from heel to end of claws.....	5.50	4.84
longest claw.....	.50	.25
Weight.....	3½ lbs.	3 lbs.

Measurements of skulls.

	$\frac{1237}{317}$.		$\frac{1236}{316}$.	
	Inches.	100ths of length.	Inches.	100ths of length.
Total length.....	2.77	1.00	3.09	1.00
Greatest width.....	1.46	.53	1.55	.56
Distance between orbits.....	.71	.25	.83	.27
Nasal bones, length.....	1.08	.37	1.21	.39
width behind.....	.65	.23	.62	.20
before.....	.44	.16	.42	.14
Upper incisors, from front to molars.....	.82	.29	.96	.31
hinder margin of palate.....	1.16	.42	1.30	.42
height.....	.28	.10	.30	.10
width between external edges.....	.16	.06	.27	.09
Upper molars, length taken together.....	.52	.19	.56	.15
distance between.....	.50	.18	.46	.15
Lower jaw, length.....	2.11	.76	2.42	.78
height.....	1.30	.47	1.49	.48
arc.....	2.21	.79	2.50	.80

The skull of this species is actually shorter than that of *L. cuniculus*, the domestic rabbit; it is, however, wider and larger in the cerebral portion; the muzzle much shorter and higher, the nasals being shorter and considerably broader. The differences between the species are very great.

This species, in summer dress, is readily distinguished from *L. campestris* by its prevailing tint of reddish brown, instead of gray, the black border on the posterior portion of the convexity of the ear, &c. In winter, the fur in *L. americanus* is lead color on its basal half; in *L. campestris*, pure white; both have the median bar of reddish. In all seasons the tail and ears are much shorter; the internal surface of the ears less densely furred and not so pure white; the black in a narrow band on the posterior margin of the ear, instead of a terminal patch at the tip, &c. The size is every way less; the difference particularly observable in the skulls.

This hare is very abundant in the northeastern portions of the United States, and, according to Richardson, reaches as far north as latitude 68°. In the regions north of the Missouri plains it is replaced by the *L. campestris*, and on the northwest coast by the *L. washingtonii*. Southward it is common as far as the northern counties of Pennsylvania, and extends along the Alleghany range into Virginia. It is not rare along the summit level of the Baltimore and Ohio railroad.

Owing to its habit of keeping in thick tangled swamps, especially cedar swamps, this species is not so readily met with in localities even where it abounds as the small gray rabbit, *L. sylvaticus*.

The synonymy of this species has been somewhat confused, but has been very admirably disentangled by Dr. Bachman in the several articles quoted above. Some remarks on his reference of Schreber's article on *L. nanus* will be found under the head of *L. sylvaticus*.

List of specimens.

Catalogue number.	Corresp'ng No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.										
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height, ante'ly.
250	1202	.....	Quebec.....	Aug. 1853..	S. F. Baird.....	Skin.....	3.33	4.00	20.00	1.50	2.25	.....	5.50	.....	.....	3.00	.....
1073	.....	♂	Middleboro', Mass.....	Nov. 27, 1855	J. W. P. Jenks.....	do.....	.....	3.75	21.00	.....	.....	.....	2.25	5.15	.....	.....	3.35
1074	.....	.....	do.....	Dec. 8, 1855	do.....	do.....	.....	.....	18.50	.....	.....	.....	2.32	4.85	.....	.....	3.13
1075	.....	.....	do.....	Nov. 30, 1855	do.....	do.....	.....	.....	17.50	.....	.....	.....	4.57	.....	.....	.....	3.16
1076	.....	.....	do.....	Nov. 23, 1855	do.....	do.....	.....	3.15	17.50	.....	.....	.....	4.98	.....	.....	.....	3.05
959	2003	♂	do.....	Oct. 23, 1855	do.....	do.....	.....	.....	18.50	.....	.....	.....	2.41	5.20	3.20	1.55	3.15
960	2004	♂	do.....	Oct. 17, 1855	do.....	do.....	.....	3.22	17.00	1.33	2.23	.....	5.46	3.16	1.61	3.30	.....
1072	.....	♂	do.....	Dec. 2, 1855	do.....	do.....	.....	.....	.....	.....	.....	.....	4.90	.....	.....	.....	3.10
1439	.....	♂	do.....	Dec. 24, 1855	do.....	do.....	.....	.....	20.00	.....	.....	.....	2.46	5.10	.....	.....	.....
1440	.....	♂	do.....	May 7, 1856	do.....	do.....	.....	.....	.....	.....	.....	.....	2.40	4.92	.....	.....	3.25
1569	2399	.....	Essex county, N. Y.....	Winter.....	Dr. S. E. Hale.....	do.....	.....	.....	.....	.....	.....	.....	5.32	3.20	1.55	2.70	.....
1570	2400	.....	do.....	do.....	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
849	1906	♂	do.....	Sept. 6, 1855	S. F. Baird.....	do.....	.....	.....	18.00	.....	.....	.....	5.63	3.05	.....	.....	3.60
863	1915	♂	do.....	Oct. 14, 1855	do.....	do.....	1.33	2.42	.....	10.50	1.08	2.50	.....	3.66	2.50	1.40	3.17
552	1671	♂	New York State.....	Winter.....	Market.....	do.....	.....	.....	21.00	.....	.....	.....	5.30	3.17	1.61	3.60	.....
551	1670	♂	do.....	do.....	do.....	do.....	2.00	3.50	4.00	19.50	1.33	2.92	.....	5.38	3 lbs	.....	3.40
316	1236	.....	do.....	Dec. 1, 1854	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	3.15	1.60	.....	.....
481	1605	.....	do.....	Feb. 2, 1855	do.....	do.....	.....	3.60	18.00	1.15	2.25	.....	5.68	3.25	1.65	3.38	.....
66	969	.....	Northern Pennsylvania.	Winter.....	do.....	do.....	.....	4.18	19.00	.....	.....	.....	.....	.....	.....	.....	3.40
67	970	.....	do.....	do.....	do.....	do.....	4.00	4.37	22.00	1.00	1.75	2.55	5.50	.....	.....	.....	3.40
317	1237	.....	do.....	do.....	do.....	do.....	3.52	17.00	.....	.....	.....	.....	4.58	2.85	1.49	.....	.....

LEPUS WASHINGTONII, Baird.

Red Hare.

Lepus washingtonii, BAIRD, Pr. A. N. Sc. Phil. VII, April, 1855, 333.

Ears shorter than the head; hind feet much longer than the head. Size about that of *L. sylvaticus*, or a little larger. Fur very soft and full on the body and beneath the feet. Tail very short. Back, sides, and throat reddish brown; the former with many glossy black hairs. Tail lead color above, rusty white beneath. Abdomen pure white. Ears black on the posterior margin and tip of their inner surface; the rest of this surface pale reddish brown, except on the exterior band.

This beautiful species occupies a position intermediate between *L. sylvaticus* and *L. americanus*. It is about the size of the former, and colored somewhat like the latter. Two specimens received agree in color. It is not yet known whether the species changes in the winter; the specimens, however, were procured in February, March, and April, when the winter dress is usually still retained.

The fur is dense and soft, very different in this respect from *L. sylvaticus*. The feet are very well furred; in fact, the pads are so full that the hairs curl not unlike prepared horsehair. The ears are rather shorter than the head, though longer than in *L. sylvaticus*. The tail is very short.

The upper parts and sides of the head and body, throat, and external surfaces of the limbs, are of a rich reddish brown, or dull chestnut, darkest on the back, where the color is lined with black. There is a slight mixture of black hairs on the other regions more or less distinct. The tail is rusty white beneath; above, dark lead color. The abdomen is pure rich white; the chin grayish white. The posterior edge of the fore legs, and the interior face of the hind ones, are whitish, more or less mixed with reddish. The posterior edge of the thigh shows a good deal of dark lead color.

The fur on the back is dark lead color for most of its length, shading through a very faint rusty tinge into black; it is then reddish brown, and finally tipped with black. Interspersed are many long hairs entirely glossy black; the abundance of these posteriorly imparts a prevailing black tint. On the sides, the pale rusty beyond the lead color is more intense, and the brown is very light. In one specimen all the hairs on the belly are lead color at the base; in another they are white anteriorly. In both, the pads on the under surface of the tarsus are strongly relieved against the portion underneath the toes, which is dirty yellowish on all the feet.

The external and internal bands of the ears are like the back; on the exterior surface the hairs within the internal band are whitish. The posterior edge of the ear is whitish, invaded above by the brownish black of the inner face. This face is black on the posterior margin, the color commencing about one-fourth its length from the base, and, widening above, forms a tip to the ear of half an inch in length, slightly invading the external band. The rest of the ear is pale reddish brown. The nape and back of the neck are of the same reddish brown with the back, without any black, no appreciable variation being discernible as in *L. sylvaticus*, *L. palustris*, and other species.

The skull of this species (1223) is remarkable for its straight outline above, and its general depression, compared with *L. sylvaticus* and *americanus*. The portion anterior to the molars is longer, narrower, and the sides more vertical than in *L. sylvaticus*.

The species is readily distinguishable from *L. americanus* by its smaller size and shorter ears, which are more reddish internally. The tarsi are much shorter. The colors are not dissimilar, but the *L. washingtonii* has much softer fur, and a richer, darker, reddish brown.

From *L. sylvaticus* it is distinguished by its longer tarsi and ears; the latter bordered with black behind; the fur is reddish brown not yellow brown; there is no gray on the sides anywhere, and the nape is not different from the back, as in *L. sylvaticus*, *palustris*, *artemisia*, and other species.

Since the preceding description was prepared, Dr. Suckley received several imperfect skins of hares from the latitude of $54^{\circ} 40'$, which, in all probability, belong to the same species. One in summer dress appears to be immature, and although the general appearance is as described, yet there is rather more yellow in the cinnamon color. The feet and ears are wanting. The other skins, two in number, are similarly mutilated. In these the color externally is snowy white. The under fur, however, is light plumbeous for more than its basal half, darker towards the end; it is then of a pale yellowish brown, of two shades, the outer half abruptly and appreciably darker, this color forming the tip of the fur. The white is due to the long hairs which are pure white to the roots. On the belly the hairs are without the brown, although the basal plumbeous is quite distinct. In this respect the colors are very similar to those of *L. americanus*, although the fur is longer.

In all the specimens I have seen, the portion of the pads under the toes is of a brownish white, sharply and distinctly lighter than the remaining portion, which is strongly tinged with sooty. This may be considered a pretty good specific mark.

As already stated, this species is very similar to *L. americanus*, and should the more northern individuals turn white in winter, the resemblance will be still greater. The color, in perfect specimens, is much the same. The size of *L. washingtonii* is, however, much less; the tarsi especially. There is considerably more black at the tip of the ear, and its dorsal surface is light cinnamon, instead of being nearly white. In fact, there is scarcely any white on the ear, this being confined to the extreme margin, instead of having the fringe and much of the dorsal surface of this color.

Thus far, this species has only been found in Washington Territory, on and west of Puget's Sound, unless, as is highly probable, Dr. Suckley's specimens from the latitude of $54^{\circ} 40'$ should belong here. It constitutes the western representative of *L. americanus*.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.								Collected by--
							Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	Length of fore ft.	Length of hind ft.	Ht. of ear anteriorly.		Ht. of ear posteriorly.
280	1223	Steilacoom, W. T.....	Apr. 1, 1854	Gov. I. I. Stevens.....	7	Skin	3.42	18.50	.66	1.50	4.42	2.60*	3.25	Dr. Suckley	
2808	3199	do	Nov., 1856	Dr. Geo. Suckley	133	do.	18.00				4.20	2.60			
1422	2403	Vancouver.....	Feb., 1856	do.....		do.					3.52			Geo. Gibbs.	
303 ¹		Shoal Water bay, W.T.	Mar.5, 1854	Gov. I. I. Stevens.....	15	do.	1.75	3.00	16.00	.84	1.75	1.90	4.13	Dr. Cooper.	
1185		Cape Flattery, W. T. ...		Lt. W. P. Trowbridge		do.									
?2400		Pacific coast, 54° 40'	Summer,'56	Dr. Geo. Suckley	142	Piece of skin									
?2398		do	Winter.....	do	140	do.									
?2399		do	do.....	do	144	do.									

¹ Length before skinning, 17 inches; radius and tibia each 4 inches; iris brown.

* Width of ear 1.70.

LEPUS CAMPESTRIS, Bach.

Prairie Hare.

Lepus campestris, BACH, J. A. N. Sc. Phila. VII, II, 1837, 349.—IB. VIII, I, 1839, 80.

WATERHOUSE, N. H. Mamm. II, 1848, 127.

GIEBEL, Säugt. 1855, 449.

Lepus townsendii, BACHMAN, J. A. N. Sc. Phila. VIII, I, 90; pl. ii.

TOWNSEND'S Narr., 1839, 325.

AUD. & BACH. N. Am. Quad. I, 1849, 25.; pl. iii.

Lepus virginianus, RICH. F. B. Am. I, 1829, 224.

PR. MAX. Reise, I, 1839, 508.

Lepus virginianus, var HARLAN, F. Amer. 1825, 310.

SP. CH.—Larger than *Lepus americanus*. Ears about one-fifth longer than the head. Fur soft and full, especially in winter. Tail as long as the head. Hind feet considerably longer than the head; somewhat longer than the ears.

In summer, back, rump, sides of limbs, external and internal bands of the ear, and the throat, yellowish gray, varied more or less with brown. Beneath white. Tail entirely white, above and below; in some specimens only with a faint wash of ash above. Nape and interior surface of ears white, except as stated; the latter tipped with black.

In winter, pure white all over, with a yellowish tinge. Ears white, tipped with brown; the external and internal bands rusty gray. Fur on the ears and elsewhere much longer and fuller than in summer. Fur on the upper part and sides pure white on the basal half.

This species is among the largest of the North American hares, and is characterized essentially among those with ears considerably longer than the head, by having no black or even dusky on the upper part of the tail and the rump. As far as known, too, it is the only one of the very long eared hares in which the fur becomes white in winter. The ears are not quite so long, however, as in the *L. californicus* and *callotis*. The summer fur is full and soft; the winter still more so, being quite valuable as an article of commerce. The tail is very long. The legs are long and stout, well furred beneath. The ears are about one-fifth longer than the head.

Summer pelage. The general color of the upper parts of the body and the buttocks is a pale yellowish gray, mixed with a dark brown, the former predominating. The hairs are light ash at the base, turning gradually into pale reddish or rusty gray, and finally, tipped for a slight extent with darker brown or black. There are numerous longer hairs interspersed, which are

entirely black. The sides are of a more unmixed ashy gray. The upper part of the chest and the throat are gray, with a slight tinge of rusty. The anterior surface of the fore legs, with the exterior faces of the hind legs, similar. The under surface of head, the eyelids, the abdomen, limbs, with the exceptions as stated, with the tail are smoky white; the latter ash colored along the median line above. The sides and ends of the snout are tinged with rusty. The under surfaces of the feet are grayish brown. The nape and back of the neck are smoky white, (grayish on the median line,) this color running up and occupying the entire inner surface of the ear and its posterior margin, except for three quarters of an inch at the tip, where they are sooty brown, the margin at the same time becoming creamy in color. The external and internal bands are like the back. The anterior fringe is composed of very long hairs of a reddish white color.

The specimen thus described, No. 85, was collected by Mr. Townsend on the banks of the Columbia river, and corresponds to the *Lepus townsendii* of Dr. Bachman.

Another specimen, No. 223, collected at Fort Union, in 1853, by Dr. Suckley, agrees in all respects except that the sides of the head are tinged with pale rusty. There is more white on the legs, and the tail is pure white. The ears are rather shorter, although the specimen is smaller.

A specimen, No. 69, collected in winter, at Fort Union, by Mr. Alexander Culbertson, is pure white all over, with a yellowish tinge. The hairs on the back are snow white for half their length from the base, then shading into very pale reddish brown, and finally tipped largely with yellowish white. The central darker color, however, does not show except when the fur is parted. On the sides of the neck and shoulders these hairs are slightly plumbeous at the base; along the flanks and beneath, as well as on the entire tail, they are pure white throughout. The internal and external fringes are reddish white, the hairs brown at their bases; the tip of the ear, for an inch, (except on the outer band,) is brown. The soles of the feet are yellowish.

The fur is very soft and full, more or less crimped and curled at the basal half. The long scattered hairs on the back are two inches long; the average of the fur about one and a half inch.

The skull (972) of the winter specimen, No. 67, compared with that of *L. callotis*, (1191,) of the same size, shows the molars further removed from the front of the canines; the anterior upper molar considerably smaller; the zygomatic arch much lower anteriorly, and the separation of the zygomata and the temples greater; the lower molars narrower; the lower jaw narrower and shorter.

This species inhabits the northern part of the United States from the Missouri river to the Columbia. It is quite abundant on the Missouri, and extends as far south as the Platte at Fort Kearney. Dr. Suckley collected one specimen near Fort Boisé.

This species was first described by Dr. Richardson as the *Lepus virginianus*, supposing it to be what is now known as *L. americanus*. Dr. Bachman gave to it the name of *L. campestris*, and subsequently receiving a specimen from Mr. Townsend, and assured by him that it did not turn white in winter, he named it *L. townsendii*. He has, however, since then suspected that the *L. townsendii* did become white in winter, and was identically the same with *L. campestris*. This supposition has been verified by the reception of specimens from Fort Union, both in summer and winter dress; the former agreeing precisely with a summer specimen collected by Mr. Townsend on the banks of the Columbia river.

Additional specimens received since the preceding description was written substantiate the identification of the white and gray hares of the upper Missouri. The summer skins vary but little, chiefly in a yellowish wash to the gray of the back, and in the greater or less purity of the white of the back of the ear. In one specimen, 456, this is of a snowy whiteness. In most specimens the long tail is pure white throughout; in others there is a slight tinge of ashy along the central line.¹

¹The following description and measurements are taken from Prince Maximilian :

Lepus virginianus, (*campestris*), Pr. Max. Reise in das innere Nord-Amerika, I, 1839, 508. This hare in winter is entirely snow white, except the tip of the nose, sides of the upper lip to the corner of the mouth, upper surface of the fore foot, and outer border of the fore arm, which are beautiful yellowish red color, (coffee and milk). The ear is black at the tip, more or less yellow on the anterior edge; down each toe of the hind feet is a bright yellowish red stripe. The incisors are yellowish; the iris yellowish gray brown.

Measurements.

	Inches.	Lines.
Total length to end of caudal hairs	23	6
Tail to end of hairs	5	4
vertebræ.....	3	6
Length of head.....	3	11
Width of head between eyes.....	2	1
Height of ear, (above crown)	4	6
Greatest width of ear.....	1	8
Bristles	4	-----
Fore leg from elbow to tip of claws.....	6	9 $\frac{3}{4}$
Longest fore nail		6 $\frac{1}{2}$
hind nail		6 $\frac{3}{8}$
Hind feet.....	5	6
Circumference at thorax.....	13	5
Length from snout to end of outstretched hind foot..	29	9

The largest specimen seen of this hare measured 25 inches from nose to tip of hairs of tail. Found above Fort Union.

Measurements of fresh specimens, made by Dr. Hayden.

	A.	1794.
	Inches.	Inches.
Nose to occiput	4.50	4.58
eye.....	2.00	2.25
ear.....		
root of tail.....	21.00	22.25
end of outstretched hind legs.....	29.50	31.50
Tail from root to end of vertebræ.....	2.50	3.25
hairs.....	4.25	4.50
Ears, height, posteriorly	5.25	5.00
anteriorly	4.75	4.75
internally above the skull.....		
width.....	2.16	2.75
Arm, between claws across shoulder.....		22.50
length of fore arm.....	12.50	10.50
from elbow to end of claws	6.50	7.75
fore foot to end of claws.....	2.50	3.00
longest claw	.50	.75
Leg, from knee joint to end of claws.....	10.13	10.75
tibia	6.00	6.00
hind foot from heel to end of claws	5.75	6.00
longest claw	.63	
Weight.....		8 lbs.

List of specimens.

Catalogue number.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—		
							Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.		Width of skull.	Height of ear.
69		Fort Union, Nebraska.....	Winter.....	E. T. Denig & T. Culbertson.	.....	Skin, (white)...	.....	4.17	.....	23.00	2.50	4.25	.....	5.25	3.80	1.81	4.90	.....
2977		do.....	do.....	do.....	.....	Skin, (in alc.)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
923		do.....	Summer, 1853	Gov. I. I. Stevens	.....	Skin.....	1.90	3.50	3.65	18.50	2.10	4.10	.....	.....	.....	.....	4.45	Dr. Suckley.....
1795		Yellowstone.....	Aug. 18, 1856	Lieut. G. K. Warren.....	.....	..do.....	2.20	3.50	4.05	19.50	.....	.....	2.65	5.40	.....	.....	4.96	Dr. Hayden.....
3208		do.....	.....	.....do.....	.....	Skull.....	.....	.....	.....	.....	.....	.....	.....	.....	3.66	1.80	.....	.....do.....
1794		Powder river, Nebraska.....	1856.....	do.....	B	Skin.....	2.35	3.92	4.45	23.00	2.35	5.40	2.50	5.40	.....	.....	.....	.....
933 ¹		Fort Pierre, Nebraska.....	Winter.....	Dr. J. Evans	.....	Skin, (white)...	.....	.....	.....	.....	2.30	4.40	2.60	5.40	3.40	1.75	.....	.....
1900	...	60 miles N.W. Fort Riley, K. T.	June 29, 1856	Lieut. F. T. Bryan.....	47	Skin.....	.....	.....	4.25	17.00	.....	.....	.....	5.05	3.31	1.66	4.35	W. S. Wood.....
1829	♀	Cache le Poudre creek, Neb....	Sept. 6, 1856	do.....	323	..do.....	.....	.....	5.00	22.00	3.75	5.50	.....	5.55	3.70	.....	4.50	do.....
1898	♂	Bridger's Pass.....	Aug. 13, 1856	do.....	257	..do.....	.....	.....	4.50	20.50	3.00	5.50	.....	5.55	3.50	.....	.....	.....do.....
456 ²	♂	Snake river, O. T., 100 miles above Fort Boisé.	Oct. 5, 1854	Dr. George Suckley.....	29	..do.....	.....	.....	.....	.....	2.35	4.55	2.70	5.50	.....	.....	4.98	.....
85		Columbia river, O. T.....	Summer.....	Philadelphia A. N. S.....	.....	Mounted.....	.....	3.60	.....	21.00	2.00	3.25	.....	5.42	.....	.....	5.00	J. K. Townsend..
1170		Klamath lake, O. T.....	1855.....	Lieut. Williamson.....	.....	Skin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Dr. Newberry....

¹ Eyes pale yellow.² 25½ inches to end of tail before skinning.

LEPUS CALLOTIS, Wagler.

Jackass Rabbit; Texas Hare.

Lepus callotis, WAGLER, Nat. Syst. Amph. 1830, 25.—*IB.* Isis, 1831, 511.WAGNER, in Schreber Säugt. IV; pl. cccxxiii, E. (original figure).—*IB.* Suppl. Schreb. IV, 1844, 106.

WATERHOUSE, Nat. Hist. Mamm. II, 1848, 138.

AUD. & BACH. N. Am. Quad. II, 1851, 95; pl. lxiii.

GIEBEL, Säugt. 1845, 449.

Lepus nigricaudatus, BENNETT, Pr. Zool. Soc. Lond. I, 1833, 41.

BACHMAN, J. A. N. S. Phil. VIII, 1, 1839, 84.

? *Lepus flavigularis*, WAGNER, Suppl. Schreb. IV, 1844, 106.? *Lepus texianus*, WATERHOUSE, N. H. Mamm. II, 1848, 136, probably not of Aud. & Bach.

SP. CH.—Rather smaller than the European hare. Ears very long and broad; nearly one-third longer than the head and one-fifth longer than the hind foot. Hair on the buttocks short and close. Color above, yellowish gray, blotched and lined with black. Upper surface of tail and central line of rump, black; tail beneath, grayish white. Sides of rump, clear ash gray. Legs, ashy. Nape, black, (sometimes whitish?) Beneath, dull whitish, with a yellowish brown color on the throat. A light ring round the eye. Tip of the posterior surface of the ear black.

In a considerable number of specimens before me of the *Lepus callotis*, I find appreciable differences in color, length and texture of fur, and size of the ears, which, however, pass from one extreme to another by such gradual stages as to leave very little base for subdivision into species. In what may perhaps be considered as a typical specimen, (299,) the ears are nearly one-third longer than the head, and at least one-fifth longer than the hind feet. The tail is more than half the length of the ear. The prevailing color above is a yellowish gray, lined and waved with black in irregular amount of aggregation; the two colors quite distinct. The upper part of the tail (all visible from above) is black to the bases of the hairs; this extending up the rump for full the length of the tail, and separating on either side a patch covering the rump and thighs of a whitish ash color, finely lined with black, and in strong contrast to the more yellowish fur anterior to it, which is strongly blotched with black. The nape is sooty black. The under parts of body are white, the collar on the throat alone of a pale dirty brownish yellow; the under part of the tail is grayish white. The long hairs on the anterior margin of the ears are brownish white; the posterior margin of the ear pure white; the back of the ear is dirty brownish white; posterior face and margin of the tip of the ear are black.

Nos. 134 and 252 agree in the black nape. In all the others the nape is grayish white, with a brownish line down the centre. In some specimens there is a dusky tinge in the white. In some specimens there is a very distinct yellowish white ring round the eye. Sometimes the light color of the internal surface of the ear is a pure white in strong contrast with the terminal black. The yellowish gray of the upper parts is sometimes rather more of a buff; never as much as in the *L. californicus*, however.

In specimens from the Llano Estacado the fur is much fuller and longer. I can, however, appreciate no other difference. The fringe of the ear is very long.

Several specimens collected by Dr. Suckley at Fort Boisé, on Snake River, Oregon, agree in general characters, though differing in some respects. In one the fur is very thin and scant, being probably the old summer fur. The gray of the back is quite pure. The black of the tail and rump very broad and distinct. The color of the nape cannot be made out. The ears are as described; the black at the tip behind about an inch long. The under parts are of a smoky white; of the tail rather more brownish.

In the other specimen (455) the fur is very long and full. The prevailing color above is nearly a pure gray, blotched with black, the hairs being of this latter color subterminally for a quarter of an inch. The fur in its length and fulness is much like that described from the Llano Estacado; the subterminal annulus, however, is much blacker.

It is barely possible that an additional species may exist in the central highlands of North America; but for the present I prefer to consider the peculiarities described as rather the result of a more elevated and boreal climate.

I have never met with any specimens having the peculiar characters of *L. texianus* of Aud. & Bach. The nearest approach is in a pair of ears from Red River, Arkansas, in which the prevailing color is more of a faded cinnamon.¹

This species is similar in general form to *L. californicus*; the latter is, however, much more cinnamon colored; the under parts of the body, legs, and tail being of this color instead of whitish. The legs appear to be rather longer and more densely padded.

An article on *L. callotis*, based on other specimens, will be found in the report of the United States Mexican Boundary Survey, and in this is a notice of a specimen collected west of San Antonio by Mr. Clark, in many respects quite different from the typical *L. callotis*, and approaching somewhat to *L. flavigularis*. In this specimen (301) the fur is much longer and softer beneath; the tail is very long, with the hairs, measuring 4.08 inches. The prevailing tint beneath is light gamboge yellow instead of white. The nape is grayish, and the ears tipped with dark brown. The feet are very densely furred beneath. There are also some differences noted in the skull. These will be appreciated, in part, by the accompanying table of measurements and proportions of the skull of this variety (1215) compared with two others of the more typical *L. callotis*.

The *Lepus callotis* will be found, from the list of localities given below, to have quite an extensive range, especially if the Fort Boisé specimens should really be the same. It has not yet been found in California, and the locality given by Bennet for his *nigricaudatus* may be supposed, from this evidence, to be much further south and east of that generally understood. Thus far, if I recollect aright, not a single one of the species assigned by him to "California, adjoining Mexico," has been found in that State. The probabilities are, that they came from the southern part of Sonora, west of the Sierra Madre, perhaps not far to the northeast of Mazatlan, and from six to ten degrees south of California.

¹ The *L. texianus* of Waterhouse agrees very closely with the pale naped variety of *L. callotis* here described, and if distinct will be entitled to the name. The *L. texianus* of Audubon and Bachman appears sufficiently distinct from either.

Measurements of skulls.

Skull.	No. 1215.		No. 1191.		No. 1118.	
	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Total length ¹	3. 62	1. 00	3. 60	1. 00	3. 40	1. 00
Greatest width between zygomata.....	1. 75	. 48	1. 72	. 48	1. 66	. 48
Distance between ante-orbital notches.....	1. 02	. 28	1. 00	. 28	. 84	. 25
Nasal bones, length.....	1. 50	. 41	1. 52	. 42	1. 52	. 44
width behind.....	. 84	. 23	. 74	. 20	. 72	. 21
before.....	. 59	. 16	. 50	. 14	-----	-----
Upper incisors from front to molars.....	1. 18	. 32	1. 22	. 33	1. 05	. 30
hinder margin of palate.....	1. 54	. 43	1. 54	. 43	1. 42	. 42
height.....	. 36	. 10	. 40	. 11	-----	-----
width between external edges.....	. 26	. 07	. 23	. 06	-----	-----
Upper molars, length taken together.....	. 65	. 19	. 67	. 18	. 60	. 17
distance between.....	. 53	. 14	. 43	. 12	. 46	. 13
Lower jaw, length.....	2. 90	. 80	2. 88	. 80	2. 75	. 80
height.....	1. 68	. 45	1. 60	. 45	1. 71	. 50

¹ The measurement is to the anterior extremity of the nasal bones. To the anterior face of the incisors it is a little more.

List of specimens.

Catalogue number.	Corresponding number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—		
								Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.		Height of ear ante- riorly.	Height of ear poste- riorly.
299	.....	.....	Charco Escondido, Mex.....	1853.....	Lt. D. N. Couch.....	53	Skin	4.08	.....	19.75	2.25	3.25	2.17	4.58	.....	.....	5.07	5.42	.....
300	.....	♂	.....do	1853.....	do	83	.. do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
134	1118	.....	Eagle Pass, Tex	April, 1852	Maj. W. H. Emory .....	.....	do.....	3.83	4.00	19.50	.....	.....	2.17	4.58	3.45	1.65	4.50	4.83	A. Schott
135	1119	.....	.....do	Summer, 1852	do .....	.....	do.....	4.25	4.80	24.50	1.75	2.83	2.93	4.58	.....	.....	5.07	5.42	do
252	1191	.....	Brazos Santiago, Tex.....	Autumn, 1853	G. Wurdemann.....	.....	do.....	4.00	4.43	21.75	1.58	2.75	2.25	4.60	3.75	1.75	4.75	5.17	.....
259	.....	.....	Austin, Tex.....	.....	S. K. Jennings.....	.....	Ears .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
301	1215	.....	W. of San Antonio.....	1851.....	Col. J. D. Graham .....	.....	Skin	4.17	4.55	20.50	3.08	4.08	2.05	4.58	3.75	1.75	5.00	.....	J. H. Clark
302	1216	♂	do	1851.....	do .....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	do.....
2968	.....	.....	Llano Estacado, Tex.....	1854.....	Capt. J. Pope.....	.....	do.....	3.30	.....	19.00	.....	.....	.....	4.95	.....	.....	5.22	.....	.....
2969	.....	♂	.....do	1854.....	do .....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1720	.....	.....	Devil's River, Tex.....	May 3, 1855	do .....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1721	.....	♀	Camp on Pecos.....	Aug. 15, 1855	do .....	.....	do.....	5.00	24.00	.....	.....	.....	2.05	5.05	.....	.....	5.95	.....	.....
1722	.....	.....	.....do	1855.....	do .....	.....	do.....	4.60	28.00	.....	.....	.....	2.38	4.88	.....	.....	5.95	7.00	.....
1725	.....	♂	.....do	May 23, 1855	do .....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
346	1260	.....	Fort Conrad, N. M.....	.....	Lt. A. W. Whipple.....	.....	do.....	4.45	.....	17.50	.....	.....	2.20	.....	3.80	1.75	5.95	.....	Dr. Kennerly
454	.....	♂	Boisé River, O. T.....	Sept. 27, 1854	Dr. G. Suckley	27	do.....	.....	.....	22.50 ¹	.....	.....	1.70	4.40	.....	.....	4.90	.....	.....
455	.....	.....	.....do	do	do	28	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

¹ Measured before skinning.

LEPUS CALIFORNICUS, Gray.

California Hare.

Lepus californicus, GRAY, Charlesw. Mag. N. H. I, 1837, 586, (named only in Pr. Zool. Soc. Lond. IV, 1836, 88.)

BACHMAN, J. A. N. Sc. Phil. VIII, I, 1839, 86.

WAGNER, Suppl. Schreb. IV, 1844, 110.

WATERHOUSE, Nat. Hist. Mamm. II, 1848, 131.

AUD. & BACH. N. Am. Quad. III, 1853, 53; pl. cxii.

GIEBEL Säugt. 1855, 450.

? *Lepus richardsonii*, BACH. J. A. N. Sc. VIII, I, 1839, 88.

WAGNER, Suppl. Schreb. IV, 1844, 111.

Lepus bennettii, GRAY, Zool. Sulphur, Mamm. 1844, 35; pl. xiv. (In color rather nearer *L. californicus*.)

SP. CH.—Size large. Ears and hind feet much longer than the head, (the ears longest.) Tail as long as the head. Limbs elongated; not very densely furred. Fur rather soft. Upper parts light cinnamon and black. Sides of the body anteriorly, chest, and outer surfaces of limbs cinnamon, with a slight mixture of black. Under parts whitish cinnamon on the median line, darker externally and on the inner surfaces of the limbs. Tail dull cinnamon; the upper part and a line running up a short distance on the rump, black. Extremity of the dorsal surface of the ear, with the adjacent edges, black. Internal and external bands, dusky; rest of the dorsal surface of the ear, with the posterior edge, fulvous white; rest of the external surface, with the anterior fringe, pale cinnamon. Under surface of the head lighter than the chest. Bases of the hairs and fur above, grayish white; below, white; on the sides, light plumbeous. Nape, dusky grayish.

General color above, mixed black and light cinnamon red; the longest hairs being light smoky ash, or whitish ash, for about half the length, then dark sooty brown, then pale cinnamon red, and tipped with black; the intermediate shorter hairs are similar but without the terminal black. The fur proper is without the terminal black and sub-terminal cinnamon. The sides are similar, but with less black. The under parts are a very pale cinnamon, becoming darker along the edges of the abdomen, and the inner surfaces and edges of the limbs. These hairs on the median region of the belly are nearly white at the base, but towards the sides their bases are pale lead color, becoming darker externally. The sides of the body anteriorly, the entire throat and chest for some distance from the fore leg, and the external surfaces of the limbs are of a light cinnamon, but with very little black intermixed; a small proportion of the hairs only have annulations of this color, and these principally the longer ones. The fur here, as on the sides, is plumbeous at the base instead of ashy white, as on the back. The under part of the head is of a dirty yellowish white, clearly defined against the band on the neck just mentioned, where the fur is also much fuller. The nape behind the ears is covered with very short fur of a smoky gray, without any median line of darker; the eyelids are cinnamon, the sides of the head behind the eyes like the back, with less black.

The base of the dorsal surface of the ear is a pale fulvous white, this color running up on the posterior margin of the ear, which is densely clothed with soft compact hairs. The same color, less pure, extends over the rest of the dorsal surface or convexity, with the exception of the external band, hereafter mentioned, and about an inch of the tip, which is very dark brown, (this color not invading the external band, except at the very tip.) The internal surface of the ear, or the concavity, (with the exception of the internal band,) is like the dorsal, but more fulvous. The internal and external bands (of Waterhouse) are mixed black and light cinnamon, like the back. The anterior fringe is light cinnamon, with black tips to some of the hairs. The edge of the upper part of the ear, opposite the dark patch, is also dark.

The tail is light cinnamon beneath and on the sides ; above, it is black, this color extending up on the rump for several inches. These black hairs become sooty brown towards their bases. The long hairs on the soles and heels are dusky. There is a small white spot on the top of the crown.

In the preceding account I have given a detailed description of a skin from San Diego, the locality whence Dr. Gray's specimen was obtained. There is no great amount of variation in a large number of specimens before me, from localities extending between the Colorado river and Oregon. An extreme is seen in a very large skin from Petaluma, in which the cinnamon color is everywhere considerably more intense. The basal fur of the back is not so pure white, being strongly tinged with plumbeous.

The colors of this Petaluma specimen almost exactly resemble those of the European hare, *L. timidus*. In the latter, however, the belly and tail (excepting the dorsal line of the tail) are white, not cinnamon ; the medial black line of the rump extends much less forward ; the legs are more rufous. The ears are very much smaller and narrower ; the hind feet rather longer ; the fore feet considerably so.

The variations in this species consist chiefly in the depth of the cinnamon shade, and in the introduction of plumbeous as an element of coloration in the under fur. The more northern specimens are usually the larger.

List of specimens.

Catalogue number.	Corresp'g number of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Height of ear, ant.	Collected by—
1237	.....	.....	Colorado Desert.....	.....	.....	.....	Skin.....	1.76	3.45	3.95	20.00	3.00	4.60	.....	4.70	.....	.....	5.10	A. Schott.....
1595	.....	♂	San Diego, Cal.....	May 12, 1856	.....	.....	do.....	1.50	3.10	3.40	15.00	1.38	2.38	1.98	3.63	.....	.....	3.35	.....
2865	.....	.....	do.....	.....	.....	.....	do.....	1.76	3.45	3.95	20.00	3.00	4.60	.....	4.70	.....	.....	5.10	A. Cassidy.....
1168	.....	.....	San Francisco, Cal.....	.....	.....	.....	do.....	9.35	.....	4.70	21.00	2.95	4.70	2.30	5.10	4.00	1.75	6.00	Dr. J. S. Newberry
2918	3227	.....	do.....	.....	.....	V 349	do.....	.....	.....	.....	32.00	3.20	4.70	2.55	5.60	3.91	1.75	5.40*	Wm. Stimpson..
1980	.....	.....	Petaluma, Cal.....	.....	.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1416	2973	.....	do.....	.....	.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2976	.....	.....	do.....	.....	.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
664	.....	.....	Bodega, Cal.....	.....	.....	.....	Skin in alc.	9.35	4.10	4.75	.....	3.60	5.35	2.50	5.90	.....	.....	6.50	.....
698	.....	.....	do.....	.....	.....	.....	Skin.....	.....	.....	.....	.....	.....	.....	2.63	5.90	.....	.....	5.50	T. A. Sando.....
1169	.....	.....	do.....	Feb., 1855	.....	.....	do.....	9.40	4.75	4.90	25.00	.....	.....	2.32	5.30	.....	.....	5.82	.....
1037	.....	.....	Fort Reading, Cal.....	.....	.....	.....	do.....	9.30	3.50	4.03	20.00	.....	.....	2.65	5.05	.....	.....	5.70	Dr. Newberry....
?	3044	○	Head of Willamette, Cascade mountains.	April, 1855	.....	70	do.....	.....	.....	.....	.....	.....	.....	2.90	5.55	.....	.....	.....	.....
?	1163	.....	do.....	.....	.....	.....	do.....	.....	.....	.....	.....	.....	.....	.....	3.80	.....	.....	2.27	Dr. Newberry....

* Skulls from Petaluma measure—

2271 3.75 inches.
 2273 3.85 + 1.71 inches.
 2274 3.64 + 1.75 inches.
 Width, 3.50.

LEPUS SYLVATICUS, Bachman.

Gray Rabbit.

Lepus nanus, SCHREBER, Säugt. II, 1792, 881; pl. ccxxxiv, B. (In part only, especially the figure.)

DEKAY, N. Y. Zool. I, 1842, 93; plate xxvii, fig. 1.

WAGNER, Suppl. Schreb. IV, 1843, 114.

Lepus americanus, DESMAREST, Mamm. II, 1822, 351.

HARLAN, F. Am. 1825, 193.

AUD. Orn. Biog. II, 51; plate.

BACHMAN, J. A. N. Sc. VII, II, 326; plate xvi, fig. 3—4. (Ear and foot.)

THOMPSON, N. H. Vermont, 1842, 48.

Lepus sylvaticus, BACHMAN, J. A. N. Sc. VII, II, 1837.—IB. VIII, I, 1839, 78.

WATERHOUSE, N. H. Mamm. II, 1848, 116.

AUD. & BACH, N. Am. Quad. I, 1849, 173; plate xxii.

Der Nord-Amerikanische Haase, SCHOEPP, Der Naturforscher, XX, 1784.

SP. CH.—Hind leg, from heel, longer than the head by the length of the claws. Ears about two-thirds the length of the head. Fur full, and moderately soft. Pads of the feet full. Back light yellowish brown, banded, and lined with black; this color extending along the anterior edge of thighs. Side much grayer; across the rump clear ash, gray and black. Nape, fore legs, and outside of hind legs, yellowish rusty, anterior face of the latter whitish; throat, yellowish gray. Lower parts pure white. Tail above, like the back; beneath, pure cottony white. Ears with the posterior edge whitish; the edges of the dorsal surface, towards the tip, black, the other portion, except the external band, ashy brown. Concavity of ear whitish. Fur everywhere lead color at the base, except under the tail. Among the largest of the short-eared rabbits of North America. Ears considerably shorter than the head; measured from the base of the cartilage, of equal length.

No. 304. The dorsal region and the upper part of the tail exhibit a mixed yellowish brown and black—this color imparted by the long hairs, which are lead color for two-thirds their length; then black, then yellowish brown, and then tipped with black. The fur proper is lead color, except the extreme tips, which are blackish brown. The sides of the body and thighs and throat are mixed yellowish gray and light brown; the hairs being lead color at base, then brownish white, shading into pale rusty, and then yellowish gray (the principal color) and tipped with black. The entire rump, top, and sides, are of a much purer ashy gray, the black tips to the hairs giving somewhat the appearance of concentric circles. The fore shoulders have a light wash of rufous, this, in fact, invading the throat. The back of the neck and upper part of the back, the fore legs all round, (paler internally,) the outer surface of the tarsus and lower tibia are clear yellowish brown or pale rusty, more or less mixed on the hind legs with reddish white. Along the anterior edge of the thigh is a band of the color of the back. The sides of the head are reddish gray, with the black tips to the hairs obscurely arranged in crescent-shaped lines. Whiskers are mostly black. Entire under parts, with the exceptions stated, pure white, with a patch of pale rusty along the groin.

The ears are nearly naked on their concave surface, except posteriorly and terminally; on the back part of the ear the hairs are quite sparse. The posterior edge of the ear, with the anterior fringe, are rusty white, the internal and external bands like the back; the latter clear pale rusty towards and around the tip of the ear; the former, with a concentration of black hairs superiorly so as to form a dark line on the anterior flexure, running into a dark brown margin around the tip of the convexity of the ear. The remaining portion of the dorsal surface of the ear is a mixed dark ash and brown, paler below where it runs into the rusty of the nape. The fur everywhere is lead color at the base except under the tail, where it is pure white.

The fur is everywhere full, especially on the rump. The under surfaces of the feet are broadly and densely furred.

Measurements of fresh specimen.

	No. 304.		No. 304.
Nose to occiput	3. 25	Arm, between claws across shoulder.....	17. 25
eye.....	1. 93	length of fore arm.....	3. 08
ear.....	3. 17	from elbow to end of claws.....	4. 75
root of tail	16. 75	fore foot to end of claws.....	1. 93
end of outstretched hind legs	26. 75	longest claw	. 25
Tail from root to end of vertebræ.....	2. 00	Leg, from knee joint to end of claws.....	7. 50
hairs.....	2. 75	tibia.....	3. 42
Ears, height posteriorly	3. 00	hind foot from heel to end of claws.....	3. 58
anteriorly.....	2. 93	longest claw	. 33
internally above skull	3. 00		
width.....	1. 75		

Measurements of skulls.

	No. 1227. Skin 305.		No. 1231.		Another skull.	
	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Total length ¹	2. 77	1. 00	3. 00	1. 00	2. 85	1. 00
Greatest width	1. 46	. 52	1. 40	. 47	1. 43	. 50
Distance between orbits.....	. 68	. 24	. 70	. 23	. 80	. 28
Nasal bones, length.....	1. 20	. 43	1. 28	. 43	1. 20	. 42
width behind.....	. 58	. 20	. 60	. 20	. 67	. 20
width before	. 37	. 13	. 34	. 11	. 41	. 14
Upper incisors, from front to molars.....	. 92	. 33	. 87	. 32	. 90	. 32
from front to hinder margin of palate.....	1. 20	. 43	1. 28	. 43	1. 20	. 42
height.....	. 25	. 09	. 28	. 09	. 25	. 09
width between external edges	. 20	. 07	. 22	. 07	. 20	. 07
Upper molars, length, taken together	. 55	. 20	. 56	. 19	. 56	-----
distance between	. 43	. 15	. 40	. 13	. 40	-----
Lower jaw, length.....	2. 22	. 80	2. 38	. 79	2. 24	-----
height.....	1. 27	. 43	1. 35	. 45	1. 24	-----
arc.....	1. 27	. 43	-----	-----	2. 24	-----

¹ These measurements are taken from occiput to end of nasals. The length is a little greater to the anterior face of the incisors.

Of a number of skulls of *L. sylvaticus* not entered in the list of specimens, the largest (1231, from Washington) measured 3.05 + 1.41. This is the largest I have ever seen from the eastern States. The rest ranged mostly from 2.80 to 2.95 in length by 1.35 to 1.49 in breadth. A skull from Fort Des Moines, belonging to one of the skins, had a breadth of 1.55; this indicates a very large size.

In a large series of rabbits, from Iowa and Wisconsin, I find the average size considerably greater than in the eastern States. There is a greater mixture of black on the back, where the general colors also are grayer. The upper part of the tail is grayish. The fur beneath the tips of the long hairs of rather a sooty plumbeous tinge, instead of the decided yellowish brown of the eastern rabbit. The ears are more densely furred; the inner and outer bands mixed gray, brown, and black; the cavity of the ear grayish white; the back of the ear ashy white; a black margin encircles the dorsal surface of the ear, beginning a little above the anterior root, and extending some distance round the tip. Notwithstanding the larger size, the ears appear absolutely shorter than in the other. The white of the belly, too, appears more restricted.

Specimens from the southern States are rather smaller than those from Washington city, and have the fur harsher and coarser, the ears thinner. Winter specimens show a greater amount of black on the back than in those from Washington. This is also seen on the cheeks below the ears.

The transition to the *L. artemisia* is very gradual, and, in the case of several specimens from the upper Missouri, I find it very difficult, if not impossible, to decide to which species they belong. This is rendered the more difficult, from the fact that the western specimens of *L. sylvaticus* are more gray in color than the eastern ones, this being the color of *artemisia* also.

It is not a little remarkable that this, one of the best known animals of North America, should not have received a distinct scientific name until 1837, when Dr. Bachman, to whose critical investigations so much of the accuracy of our present knowledge of North American species is due, gave to it the name of *L. sylvaticus*. The full history of the species will be found detailed at length in the articles of Dr. Bachman, as quoted above. I will only remark, in reference to the citation of *L. nanus* of Schreber, that, while, from the unquestionable mingling of the characters of *L. americanus* and *sylvaticus* in its diagnosis and description, it cannot be taken as the name of the latter species, yet that the detailed description belongs mostly to *sylvaticus*. Most of this was derived from the article of Schoepf, with unnecessary interpolations from Forster and Pennant. The animal of Schoepf refers entirely to the *L. sylvaticus*, as will be clearly evident from the translation I give below;¹ that of the two first mentioned authors, to the *L. americanus*. The diagnosis of Schreber applies exclusively to *L. americanus*.

¹ Der Nord-Amerikanische Haase beschrieben von Johann David Schöpf. Der Naturforscher, 20 Stück, Halle, 1784. [Written at New York, (March?) 1783.]

The North American hare has universally been confounded with the common European hare, (*Lepus timidus*, L.,) which, however, is not found at all in this country, and differs greatly from the first named in more than one particular. Even Kalm considered it merely as a smaller variety of the European hare, which was, perhaps, the reason why Linnæus makes no mention of the American species.

The people of this country have no fixed name for the species, calling it sometimes hare, and sometimes rabbit. I have, however, learned from various hunters that it is everywhere the same, and that they have never met with any animal similar to the European hare. The greatest length of a full grown specimen seldom equals, or never exceeds, 1½ foot, the weight being about 2¼ or at most 3 pounds.

[Note continued.]

The following table presents the dimensions of one of the largest of these hares in the London scale.

	Inches.	Lines.		Inches.	Lines.
From tip of nose to anus.....	15	-----	Distance between the two inner orbital		
anus to tip of tail.....	2	-----	canthi.....	1	2
humerus.....	2	2	Between the outer orbital canthi.....	1	2
elbow or fore arm.....	2	6	Breadth of forehead between eyes.....		7
carpal joint to end of longest finger.....	1	8	Longer diameter of eye.....		7
femur.....	3	2	From angle of mouth to tip of nose.....		7½
tibia.....	3	5	lower jaw.....		5
heel to end of longest finger.....	3	2	Total length of lower jaw.....	2	-----
tip of nose to tip of ear.....	5	4	From hinder end of skull to shoulder		
inner canthus of orbit.....	1	5	blade.....	2	5
inner orbital canthus to the base			Distance between outstretched fore and		
of the ear.....	1	3	hind feet.....	20	-----
Length of ear.....	2	5			

Color. Forehead, cheeks, back, sides, arms, and thighs, light brown, mixed with black. The basal portion of each hair is a clear gray, this passing insensibly into a feeble black, followed by a ring of variable breadth, and of a more or less light brown or roe color. The tips of the hairs again are black for a considerable space. The long and stiff hairs are all as described; between them, however, is a softer, shorter, and waved fur, likewise gray at the base, then light brown, rarely with a black tip.

The throat is white; the lower portion of the neck light brown; the tips of the hairs mostly white, never black; rest of under parts white; the base of the fur, however, always gray.

The fore and hind feet are densely beset with short hairs of a clear, light brown, without black, shading off on the inner side into grayish white.

The upper part of the tail is like the back; the under portion entirely white; this as well as the white hairs around the anus are more wavy than the rest, and without the usual gray at the base.

The color is the same summer and winter, varying not the least in the coldest weather.

The two upper incisors project a quarter of an inch beyond their socket. Removed from the head, each forms an arch, the two extremities half an inch apart.

The molars are five, distant three-quarters of an inch from the incisors.

The lower incisors are one line broad.

The length of the ears, measured in what way you will, never much exceeds two inches, five to eight lines. Brought forwards, they cannot be brought, without violence, to the tip of the nose. Laid back, they reach to the shoulder blade. The tips are rounded off rather bluntly. Internally they have only a few thin, light hairs on the margin. On the outer margin there is a very narrow black border half a line broad, and reaching to the tip, which itself is either not at all black, or else not more so than the dusky border referred to.

The iris is black. The sclerotica white.

This animal is far inferior in speed to the European hare. It makes its form usually in the bushes, but also in hollow trees, clefts, and cavities in stone walls.

From the preceding description it will be seen that this species differs from the European hare: 1, by its invariably smaller size; 2, by its weight; 3, by its ears, which, α , if not shorter, at least are not longer than the head, β , have blunter tips, with only a narrow border of black, γ , and are entirely naked behind.

From the rabbit it differs in the white eyes, and in not digging a burrow.—(The white eyes are erroneously given.)

N. B. The description of Schreber is taken almost entirely from Schoepff, with an occasional interpolation by Pennant and others.

In comparing this description of the "American hare" by Schoepff with specimens, it will be found to form an exceedingly admirable account of the common gray rabbit, such as is seldom found in the older writers. The most characteristic points are found in the measurements; as, for instance, the hind feet, $3\frac{3}{4}$ inches; the ears, $2\frac{5}{8}$ inches, &c. The fur above is said to be light brown; the basal portion gray, passing into a feeble black, followed by a ring of light brown, and tipped with black. In *L. americanus* there is no subterminal black ring. The base of the fur beneath is said to be gray; in *L. americanus* it is pure white to the roots. The upper part of the tail is said to be like the back, the under part pure white to the roots; in *L. americanus* it is of a sooty black above, very different from the back; beneath it is of a smoky, light, plumbeous ash throughout.

There are many other distinctive features of the gray rabbit, as distinguished from *L. americanus*, which Schoepff presents in his article so as to leave not the slightest uncertainty as to the species he had before him.

List of specimens.

Catalogue number.	Correspond'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.							
							Tip of nose to occip.	Tip of nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of hind foot.	Length of skull.	Width of skull.	Height of ear.
957	2002	.....	Middleboro', Mass.....	Oct. 19, 1855	J. W. P. Jenks.....	Skin.....	3.50	16.25	1.53	2.48	3.60	2.77	1.36	2.25
958	.....	.....	do.....	do.....	do.....	do.....	3.00	15.00	1.20	2.01	3.20	.....	.....	2.20
304 ¹	.....	.....	Washington, D. C.....	Nov. 28, 1854	Market.....	.....	3.25	16.75	2.00	2.75	3.58	.....	.....	2.93
305	1227	.....	do.....	Nov. 25, 1854	do.....	do.....	3.50	15.50	1.60	2.40	3.70	2.83	1.46	3.00
306	1230	♂	do.....	Nov. 30, 1854	do.....	do.....	3.70	16.00	.....	.....	3.68	2.95	1.45	2.30
465	.....	♂	do.....	Jan. 8, 1854	do.....	do.....	3.90	16.50	1.63	2.43	3.80	.....	.....	2.70
466	1597	♀	do.....	Jan. 31, 1854	do.....	do.....	3.25	14.25	1.60	2.60	3.35	2.80	1.39	2.32
906	1952	.....	do.....	Oct. 20, 1855	do.....	do.....	3.30	15.00	1.45	2.35	3.60	2.95	1.42	2.60
1289	2090	.....	do.....	Feb'y, 1856	do.....	do.....	.....	.....	.....	.....	3.10	2.61	1.35	.....
1290	2091	.....	do.....	January, 1856	do.....	do.....	3.30	14.50	1.35	2.15	3.50	2.90	1.37	2.60
1391	2092	.....	do.....	do.....	do.....	do.....	.....	.....	.....	.....	3.35	.....	.....	.....
1292	2093	.....	do.....	do.....	do.....	do.....	3.15	14.50	1.40	1.25	3.75	2.95	1.44	2.55
1258	.....	.....	Society Hill, S. C.....	Winter.....	M. A. Curtis & Sons.....	do.....	2.95	.....	.....	.....	3.20	.....	.....	2.30
2980	.....	.....	do.....	do.....	do.....	Skin in alc.....	.....	.....	.....	.....	.....	.....	.....	.....
1257	2087	.....	do.....	do.....	do.....	Skin.....	3.07	13.50	1.20	1.90	3.45	2.94	1.40	2.65
244	.....	.....	Selma, Ala.....	.....	A. Winchell.....	do.....	3.60	16.00	.....	.....	3.65	.....	.....	2.55
136	.....	.....	Washington, Miss.....	.....	Col. Wailes.....	do.....	3.40	15.50	.....	.....	3.60	.....	.....	2.50
2304	.....	.....	Prairie Mer Rouge, La.....	1855.....	James Fairie.....	do.....	3.00	14.50	1.70	2.40	3.33	.....	.....	2.40
2305	3134	.....	do.....	do.....	do.....	do.....	.....	.....	.....	.....	3.47	.....	1.41	.....
2970	.....	.....	Indianola, Texas.....	.....	Capt. J. Pope.....	do.....	2.90	15.50	.....	.....	3.30	.....	.....	.....
1137	.....	.....	Fort Des Moines, Iowa.....	Winter.....	W. E. Moore.....	do.....	3.60	16.40	1.34	2.24	3.80	.....	.....	2.15
1138	.....	.....	do.....	.....	do.....	do.....	3.80	16.50	1.60	2.30	3.80	.....	2.25	2.25
1139	.....	.....	do.....	.....	do.....	do.....	3.50	16.40	1.50	2.40	3.90	.....	.....	2.12
1140	.....	.....	do.....	.....	do.....	do.....	3.80	16.50	1.60	2.30	3.90	.....	.....	2.30
1141	.....	.....	do.....	.....	do.....	do.....	3.40	16.00	1.48	2.28	3.92	.....	.....	2.90
1142	.....	.....	do.....	.....	do.....	do.....	3.95	16.50	1.50	2.25	3.95	.....	.....	2.33
1143	.....	.....	do.....	.....	do.....	do.....	3.75	18.50	1.45	2.85	4.12	.....	.....	2.35
1144	.....	.....	do.....	.....	do.....	do.....	3.75	16.45	1.45	2.20	3.70	.....	.....	2.30
1145	.....	.....	do.....	.....	do.....	do.....	3.80	16.50	1.50	.....	3.80	.....	.....	2.25
1146	.....	.....	do.....	.....	do.....	do.....	3.50	16.00	1.50	2.30	3.70	.....	.....	2.30
1147	.....	.....	do.....	.....	do.....	do.....	3.30	15.50	1.23	2.00	3.70	.....	.....	.....
1148	.....	.....	do.....	.....	do.....	do.....	3.38	14.50	1.45	2.25	3.85	.....	.....	2.30
1394	2231	.....	Wisconsin.....	Winter.....	J. G. Bell.....	do.....	2.95	15.00	1.50	2.45	3.95	2.95	1.40	2.10
188	.....	.....	Racine, Wis.....	.....	Dr. P. R. Hoy.....	do.....	3.80	17.00	1.70	2.50	4.20	.....	.....	2.67
784	.....	.....	Tremont, Ill.....	.....	Wm. J. Shaw.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....
717	.....	♂	Fort Leavenworth, Kansas Ter.....	Jan. 20, 1855	Lieut. Couch.....	do.....	2.60	14.00	1.40	2.05	3.60	.....	.....	2.30
1492	.....	.....	do.....	April 21, 1856	Lieut. Warren.....	do.....	3.05	13.50	.....	.....	3.53	.....	.....	2.20
1491	.....	♂	do.....	April 23, 1856	do.....	do.....	.....	.....	.....	.....	.....	.....	.....	.....
1493	.....	.....	Lower Missouri river.....	.....	do.....	do.....	3.00	13.00	1.45	2.10	3.90	.....	.....	2.40
1494	.....	.....	do.....	April, 1856	do.....	do.....	3.10	13.00	.....	.....	3.55	.....	.....	2.20
1796	.....	.....	Sioux City, Iowa.....	Oct. 28, 1856	do.....	do.....	2.68	13.80	.....	.....	3.80	.....	1.41	2.30
1490	.....	.....	Eighty miles above Council Bluffs.....	.....	do.....	do.....	3.60	16.50	.....	.....	3.95	.....	.....	2.30
1668	.....	.....	Fort Pierre, Nebraska.....	.....	do.....	do.....	3.10	14.00	1.50	2.45	3.63	.....	.....	2.37
1809	.....	.....	Fort Union, Nebraska.....	July 19, 1856	do.....	do.....	2.90	13.50	1.25	2.10	3.37	.....	.....	.....

¹ Measured before skinning.

LEPUS ARTEMISIA, Bachman.

Sage Rabbit.

Lepus artemisia, BACHMAN, J. A. N. Sc. Phila. VIII, 1, 1839, 94.—IB. in Townsend's Narrative, 1839, 329.

WATERHOUSE, Nat. Hist. Mamm. II, 1848, 126.

AUD. & BACH. N. Am. Quad. II, 1851, 272; pl. lxxxviii.

Lepus artemisiacus, (BACH.) WAGNER, Suppl. Schreber, IV, 1844, 114.

? *Lepus nuttalli*, BACH, J. A. N. Sc. Phila. VII, 1837, 345; pl. xxii.—IB. VIII, 1839, 79.—IB. Townsend's Narr. 1839, 313.

WAGNER, Suppl. Schreb. IV, 1844, 116.

WATERHOUSE, N. H. Mamm. II, 1848, 122.

AUD. & BACH. N. Am. Quad. II, 1851, 300; pl. xciv.

SP. CH.—Among the smallest of the American rabbits; considerably less than *L. sylvaticus*. Ears about as long as the head. Tail moderate. Hind feet longer than the head; very densely padded. Fur soft and full.

Above, mixed black and brownish white; the black much developed posteriorly. Sides rather paler. Thighs and rump gray. Tail above like the back. Back of the neck and fore legs rust color. Throat and sides of the neck with a tinge of pale rusty; along the edge of the abdomen this color concentrated almost into a lateral stripe; paler than the back of the neck. Edge of the ear whitish; external and internal bands grayish brown. The internal face rusty at base, then hoary, as on the exterior, for much of the surface. A narrow margin of black along the tip. Fur nowhere passing from the basal lead color to dark brown without an intermediate bar of yellowish brown.

Size considerably less than *L. sylvaticus*. Ears about as long as the head, pretty well furred. Feet moderate, very densely clothed with fur. Fur everywhere rather soft and full, especially on the rump. Tail moderate.

General color on the back, mixed black and brownish white, the former rather predominating. Sides lighter and with less of black, the transition, however, not abrupt. Rump and sides of thighs ash gray and black, different from the back. Upper part of the neck, clear pale rufous; this color seen also on the outside surface of the fore legs. The under surface of the head white; the abdomen and inside of limbs white, with a tinge of yellowish rufous, especially about the thighs; this tint concentrated along the edge of the abdomen almost into a band. The under part and sides of the neck are yellowish brown, decidedly different in tint from the sides of the body posteriorly. The anterior edge of hind legs is white tinged with rufous. Tail above like the back; beneath, white. The ears are whitish on their posterior edge. At the base of their dorsal surface they are rufous, shading into a very pale tint of the same, then ashy. A narrow border around the tip of the ear is black; the external bands mixed grayish and brown, like the lower part of the back. The inside of the ear is ashy white, brightest along the margin above; the internal band is like the external.

The fur is everywhere lead color at the base. On the anterior portion of the back, below the rufous portion, it shades into rufous, then brown, then light yellowish brown and with a slight tip of black; proceeding towards the rump the rufous bar becomes more brown, then paler and paler, until the prevailing tint here is brownish white or gray. The subterminal brown band continues much the same until near the rump, when it gradually almost disappears. The subterminal light bar is anteriorly very light yellowish brown, then becomes paler, until it is light gray posteriorly. The black ends to the hairs are much developed on the back. On the sides the colors are lighter to begin with, and become paler posteriorly to such an extent that, on the

thighs, the subterminal brown band is an obsolete trace, separating an ashy white portion from a gray. The same condition prevails on most of the rump.

The preceding description is made from a very finely colored specimen from Chihuahua, which I have referred to the *Lepus artemisia* of Bachman. Although it does not agree exactly with his description, compared with a specimen, No. 86, brought from the Columbia river by *Townsend*, there are no essential differences. The principal distinction is a less degree of black. There is a little more black on the tip of the ear; the ear, too, is a little more fully furred. A specimen collected by Dr. Suckley, on the Missouri river, 100 miles above Fort Union, agrees precisely with those from Chihuahua.

A small hare from between San Antonio and El Paso, collected by Mr. Clark, differs in some points, and especially in the prevalence of a yellow tint over those portions of the body usually light-colored. I would have less hesitation perhaps in separating it from *L. artemisia* on this account, did I feel assured that this coloration has not been caused by the skin while in alcohol, having become impregnated with some foreign substance. The ears have less hair upon them, and the black tip is more decided; for the present, however, I prefer to call this *L. artemisia*.

*Measurements of skulls.*¹

Skull.	Inches.	100ths of length.	Inches.	100ths of length.
Total length (to end of nasals).....	2. 64	1. 00	2. 54	1. 00
Greatest width.....	1. 36	. 51	1. 26	. 49
Distance between orbits	. 68	. 25	. 64	. 25
Nasal bones, length.....	1. 12	. 43	1. 09	. 43
width behind.....	. 56	. 21	. 50	. 20
before.....	. 36	. 13	. 33	. 13
Upper incisors from front to molars.....	. 86	. 33	. 84	. 33
hinder margin of palate....	1. 15	. 43	1. 06	. 42
height	. 31	. 11	. 28	. 11
width between external edges.....	. 19	. 07	. 16	. 06
Upper molars, length taken together.....	. 48	. 18	. 43	. 17
distance between	. 37	. 13	. 31	. 12
Lower jaw, length.....	2. 07	. 78	1. 94	. 74
height.....	1. 26	. 48	1. 24	. 48
arc.....	2. 11	. 80	2. 04	. 76

¹These skulls are from the Texas plains. They were measured a good while ago, before being entered, and cannot now be readily identified.

Since preparing the preceding article a large number of additional specimens have been received from various localities, and I have been very much perplexed in the attempt to find satisfactory characters for distinguishing the *Lepus artemisia* and *sylvaticus*. Thus taking a skin of each, one from Fort Dalles, O. T., (992,) and one from Washington city, (465,) both males,

in winter, I find but little difference in size; the feet very nearly the same length—those of 992 a little shorter, and the pads deeper and fuller. The ears of 992 are absolutely a little larger and broader. The general color is grayish instead of yellowish red, or reddish brown, the subterminal black bar less distinct. The ears are more fully furred, and more hoary on their dorsal surface.

The specimens from the plains of the Columbia are all remarkable for the softness of fur, the amount of hair on the ear, and the density and depth of the fur of the pads of the feet. Those from the plains east of the Rocky Mountains, in Texas and New Mexico, are of shorter fur on the body and pads, and the ears thinner, rather narrower, longer, and more pointed.

They are of rather smaller size, though this would not appear from the measurements given in the following table, but the longest mentioned are very much over stuffed. A rather darker hue is discernable in some than in those further north.

With every willingness on my part I have been unable to find any satisfactory distinctions of species in this series, owing, possibly, to the fact of the imperfect condition of most of the Texas skins.

Should the small Texas hare of Audubon and Bachman be really the *L. bachmani* of Waterhouse, as asserted by him, and identical with the Columbia river and Missouri species, then this name will have priority over *artemisia*; if different, it will still remain to be determined whether *L. nuttalli* be not really an immature specimen of the little sage rabbit. An examination of the specimen of *Lepus*, now in the museum of the Philadelphia Academy of Natural Sciences, upon which this species was based by Bachman, satisfies me that it is a very young animal, far from being mature, and that, consequently, it has no real existence in nature as the smallest known of all hares. Every feature about it is that of a half-grown animal, as shown by the comparative shortness of the ears, the oblique inclination of the upper incisors to each other, the soft shapeless woolly texture of the fur, &c.

Although no absolute certainty can be arrived at in regard to its exact character, the probabilities are that it is the young of *Lepus artemisia*, which is the only small hare that inhabits the region where it was found. It has the rather long full tail of this species, its long well-furred legs, and other features which distinguish the *L. artemisia* from *L. trowbridgii*. The name of *nuttalli* has precedence of one year over *bachmani*, and two over *artemisia*.

A very young rabbit, (1161,) (as shown by the teeth, in which the anterior molar is not yet up in place,) collected by Dr. Newberry, at Rhett Lake, agrees very strikingly with the description and dimensions of *L. nuttalli*, as does also No. 258, from Fort Pierre.

List of specimens.

Catalogue number.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.									Collected by—	
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of fore foot.	Length of hind foot.	Length of skull.		Width of skull.	Height of ear and territory.
86		Columbia river, Oregon Terr'ty.		Philadelphia A. N. S.		Mounted (def.)	1.33	2.42	2.80	13.00						2.15	J. K. Townsend.
992	♂	Fort Dalles, Oregon Territory.	Jan. 12, 1855	Dr. Suckley.	35	Skin			2.75	15.00						2.30	
993		do. do. do. do.	Mar. 2, 1855	do.	50	do.				12.00	2.00	2.50				2.30	
1172		Des Chutes Valley, Oregon Ter.		Lt. Williamson.		do.										2.35	Dr. J. S. Newberry
1161	♀	Rhett Lake, Oregon Territory		do.		do.											do.
1273		Klamath Lake, Oregon Territory		do.		Skin in alcohol.											
222		Fort Union, Nebraska.	Aug. 17, 1853	Gov. I. I. Stevens		Skin			2.18								Dr. Suckley.
1798	♂	do. do. do.	July 16, 1856	Lt. G. K. Warren.		do.								2.95		1.90?	Dr. F. V. Hayden.
1799		Yellowstone.	Aug. 8, 1856	do.	B.	do.			2.90	12.00				3.55			do.
1553		Upper Missouri.		do.		do.											do.
2972		do.	Feb. 17, 1857	do.		Entire in alco.	1.30	2.36	2.63				1.45	3.35		2.27	do.
1669		Fort Pierre.	1856	do.		Skin											do.
258	♀	do.		Dr. J. Evans.		do.											
2981	♂	Bijou Cr., Platte river.	Sept. 11, 1856	Lt. F. T. Bryan.		Skin in alcohol.											W. S. Wood
298		Chihuahua City.	Oct. 16, 1854	J. Potts.		Skin.	1.42	2.42	2.83	11.50	1.00	1.58		3.00		2.90	
297		do.	do.	do.			1.25	2.42	2.75	13.50	1.25	2.00		3.10		2.40	
340		Jornada del Muerto, N. Mexico.		Lt. Whipple.		Mounted.			2.14					3.00	2.21	1.80?	Dr. Kennerly.
373		Pecos to Rio Grande		do.		do.			2.88	12.00				3.28	2.60	1.30	do.
314		Llano Estacado.		Capt. Pope.		Skin.			3.00	15.25				3.20			
313		do.		do.		do.								2.95			
1723		Crossing of Pecos.	May 24, 1855	do.	91	do.			2.90	15.50				3.03		2.57	
1724		do.	do.	do.	112	do.			3.20	16.00	1.00	1.70		3.25		2.70	
1726		do.	July 18, 1855	do.	111	do.			2.35	14.00	1.30	2.01		2.99			
315		San Antonio to El Paso	1851.	Col. J. D. Graham.		do.			2.95	12.00	1.23	2.08		3.13	2.62	1.35	J. H. Clark.
1417		Matamoras.		Lt. D. N. Couch.		Skull.									2.60	1.25	Dr. Berlandier.
1418		do.		do.		do.									2.65	1.36	do.
1419		do.		do.		do.									2.52	1.27	do.
1523		do.		do.		do.									2.68	1.36	do.

LEPUS BACHMANI, Waterhouse.

Bachman's Hare.

Lepus bachmani, WATERHOUSE, Pr. Zool. Soc. Lond. VI, 1838, 103.

BACHMAN, J. A. N. Sc. Phila. VIII, I, 1839, 96.

WATERHOUSE, N. H. Mamm. II, 1848, 124.

AUD. & BACH. N. Am. Quad. III, 1853, 35; pl. cviii, (description and plate from Waterhouse's specimen.)

Sp. Ch.—Size less than that of *L. sylvaticus*. Ears, tail, and tarsi shorter in proportion. Ears dusky along the anterior edge; above very sparingly clothed with hair. Above yellowish brown mixed with black; the fur on the posterior half of the back lead color at base, then dark sooty brown, yellowish brown, and black, there being only one bar of rusty or yellowish brown on the hair; fur everywhere gray at base. Sides and fore feet much paler, and with less brown. Sides of rump gray. Back of neck, fore legs, and hind legs in part dull brownish rusty. Under parts dull white.

This species is somewhat less in size than *L. sylvaticus*, and seems remarkable for its small head and ears compared with the size of the body. The orbit is equally small in its proportions. The ears are a little shorter than the head, and are very scantily furnished with hair. That on the external band is very short and close; the internal scarcely perceptible, while the rest of the two surfaces appear almost naked, although a close examination shows short scattered hairs. The fur over the body generally is rather short, especially on the abdomen. The legs, too, are scantily furred; in this respect somewhat like *L. palustris*. The hair, however, is not so stiff anywhere, especially on the feet. The tail is short.

The general color of the upper parts is a yellowish brown, lined and banded with black. On the sides and throat this brownish turns to yellowish gray; lower down, or along the color of the belly, there is a very light rusty tint. The fore legs and the back of neck, from the occiput to between the shoulders, are rusty chestnut; this color extending further than usual down the back, quite broad, and the hairs very short. The color is lighter on the sides of the neck above. The neck beneath is colored like the sides; the belly and under part of the head brownish white; the anterior edge of the hind legs dull whitish; the posterior dull rusty. There is a general dark effect on the sides of the head produced by the black hair; this not arranged so clearly in crescentic bands. The edge of the orbits is black, especially above; around the eye a rather distinct circle of rusty whitish. The ears are very plainly colored; dull yellowish white at the base interiorly; the short scattered hairs blackish; the external band like the back, with a crowding of black along the anterior margin, and a narrow dusky margin to the superior half of the ear, and passing a short distance round to the posterior edge. On the external edge of the ear the internal band is very pale uniform yellowish; the hairs on the remaining surface, with the anterior fringe, grayish white.

The fur is everywhere lead color at the base; on the back it gradually passes into black, then yellowish brown, and slightly tipped with black.

Compared with *L. sylvaticus*, the head, feet, tail, and ears are shorter in their proportions. The rusty on the back of the neck and legs is less bright. The ears are much more scantily haired. A striking distinction is observable in the fur of the lower part of the back. This is lead color at the base, then dark sooty brown to black, then yellowish brown, &c. In *L. sylvaticus*, on the contrary, the lead color passes through pale rusty to brown before reaching

the yellowish brown, the dark brown being thus between two light bars, instead of a light and lead colored one.

The skull of this species is intermediate in size and shape between those of *sylvaticus* and *artemisia*. It is less curved than in either, the horizontal crest of the upper part of the occipital region standing further from a horizontal plane. The post-orbital processes are fused behind with the cranium, enclosing a foramen instead of a notch. The character of the skull is entirely different from that of *L. palustris*.

Measurement of a skull.

Skull.	1193 234	
	Inches and 100ths.	100ths of length.
Total length to end of nasals	2. 68	1. 00
Greatest width	1. 30	. 48
Distance between ante-orbital notches.....	. 63	. 23
Nasal bones, length	1. 15	. 43
width behind	. 50	. 19
before	. 34	. 13
Upper incisors from front to molars	. 86	. 32
hinder margin of the palate.....	1 11	. 41
height	. 26	. 09
width between external edges.....	. 28	. 10
Upper molars, length taken together.....	. 50	. 19
distance between.....	. 40	. 15
Lower jaw, length	2 15	-----
height	1 26	-----
arc	2. 15	-----

The identification of this species with the *L. bachmani* of Waterhouse is with some considerable degree of uncertainty, although the characters agree better than with any other before me. I had previously given this name to a widely different species (*L. audubonii*) from California, chiefly on the ground of locality, although recognizing many differences. The locality of California, as given by Audubon and Bachman to Waterhouse's specimen, is apparently very incorrect, as this author gives "southwest portions of North America, *perhaps* California." In another article, however, he speaks of a specimen of *L. palustris* as having been received in the same collection. This renders it much more probable that Texas was the "southwest portion of North America" referred to, as the skin of *L. palustris*, described by Gray under the name of *L. douglassii*, var. 2, was in all probability a portion of the Texas collections of Douglas.

The specimen 234 agrees pretty well with Waterhouse's measurements, allowing for rather larger dimensions, (Waterhouse suspected his animal to be rather immature.) The difference in the length of the ear is probably owing to the fact that his measurement was made from the extreme end of the cartilage, while mine is from the projection above the skin anteriorly. The character of having the fur on the back lead colored, then almost black, then with a subterminal

pale bar, as described, is a very peculiar one, only found in some small California species, (otherwise very different,) and in the *L. aquaticus* and *palustris*. The only important discrepancy is in regard to the feet, which are said to be densely furred, while in the specimens before me they are scantily furred, intermediate in this respect between *L. palustris* and *sylvaticus*. How constant this character may be here, I do not know; but if the species be not *bachmani*, I know not how otherwise to identify it in the many hundreds of skins of hares before me from all parts of North America. It cannot be either of the small California species, as I shall endeavor to show hereafter, while its reference to the small hare of the high plains of Texas and New Mexico, as made by Audubon and Bachman, is prevented by the peculiarity of color of the dorsal fur, which, in these Texas animals just mentioned, has the fur plumbeous at base, then reddish, then dusky, and then the subterminal yellowish brown bar, instead of a nearly black bar immediately succeeding the plumbeous, to be followed by the yellowish brown annulus.

At any rate, this species is very different from any other American hare except *bachmani*; and rather than run the risk of loading science with a new synonym, I place it, for the present at least, under this species. Its scantily furred and short feet approximate it to *L. palustris*; but it is otherwise very different in texture of fur, color, skull, and all important characters.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.									
					Nose to eye.	Nose to occip.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of hind foot.	Length of skull.	Width of skull.	Height of ear, ant.	Height of ear, post.
234	1193	Brownsville, Texas	Lieut. Couch.....	Skin .....	.....	2.60	12.60	1.25	1.58	3.00	2.72	1.35	2.35	.....
243	1234	do.....	Capt. Van Vliet	...do.....	1.25	2.70	15.00	1.33	1.66	3.00	.....	1.32	2.10	2.42

LEPUS AUDUBONII, Baird.

Audubon's Hare.

SP. CH.—Size a little less than that of *L. sylvaticus*; ears longer than the head; hind feet rather short, longer than the ears; fully furred beneath. Tail rather long.

Above, mixed yellowish brown and black, paler on the sides and throat; beneath, pure white. Thighs and rump grayish. Back of neck rusty; fore legs somewhat similar. Hairs lead color at the base, on the middle of the back (over the loins) passing directly through dark brown to black, then yellowish brown; on the sides, rump, and fore part of back, the passage into the first brown or black ring is through grayish, yellowish, or reddish brown.

Size less than *L. sylvaticus*; ears longer than the head, moderately coated with hair inside and out. Fur rather harsh, but softer than in *L. sylvaticus*. The feet smaller in proportion; well furred beneath, about as in *L. sylvaticus*. Tail rather long.

The general color of the fur above is a rich yellowish red brown, more yellowish on the sides. On the back this color is mixed with black, on the sides with brown. The sides are without the gray tint of *L. sylvaticus*; this, however, occurs to a certain extent on the rump and outside of the thighs. The color of the back runs down the sides along the anterior edge of the thigh,

as in many species. The upper part of the tail is like the back, but grayer, the rest pure white to the roots. Head beneath and under parts generally, pure white, with a slight tinge of yellowish rusty externally, this color glossing the adjacent regions of the sides. The throat is like the sides. The nape and upper part of neck to between the shoulders are uniform pale rufous, deeper behind, where it tinges the variegated hairs of the back. The posterior edge of fore limbs and the inner of the hind ones, with the upper face of the hind feet, are pure white; the upper surface of the fore feet somewhat similar, but much mixed with rusty. There is a good deal of light yellowish brown on the sides of the head. The dorsal surface of the ears is like the back of the neck at their extreme roots, then abruptly grayish or greenish white; this color pervades the rest of this surface, especially along the posterior margin and edge of the ear; superiorly, however, it runs into a clear decided black, which covers the tip of the ear, including both edges, to the extent of more than half an inch. The external band is mixed gray and black, with scarcely any yellowish, and the hairs are very close pressed; along the anterior margin, just within the anterior fringe, dusky predominates, so as to be continuous with the black tips. The anterior fringe, with the whole concavity of the ear, are of a greenish white, the hairs brownish at the base along the internal band, and slightly rusty along the tips.

The hair is everywhere lead color at the base, except on the back of the neck and part of the tail; darkest on the back. In the middle of the back it passes directly through dark brown into black, then yellowish brown and tipped with black. On the fore part of the back, in the region of the rufous margin, the lead color changes into rusty. On the sides the lead color passes into very pale yellowish brown, which on the thighs is rather grayish. On the posterior portion of the back the lead color passes first into pale yellowish brown, and then has a grayish tint, especially on the whole rump.

This species may be distinguished from *L. sylvaticus* by its smaller size, proportionally longer ears, with their closer fur and well marked black tips and gray and black external band, shorter feet, &c. There is more red in the color of the back of *L. sylvaticus*, in which, too, the hairs on the back pass from lead color, through a yellowish brown or rusty, into the brown, and the rufous nape is lead color at the base. There is more difference between the back and sides, and the line of separation more strongly marked. *L. palustris* has the ears much shorter and more obscurely marked, the fur harsher, the feet more scantily clothed; in fact, different every way. The color is darker than in *L. artemisia*, the ears much longer, the tarsi shorter and more thinly padded.

Without any authentic specimen of *L. bachmani* for comparison, this species appears to differ from the descriptions of Bachman and Waterhouse, in still longer ears, which are decidedly black at the tips.

The tail is much longer, (2 to 3 inches instead of 1.25,) the hind feet considerably shorter in proportion. The colors are somewhat similar, and there is a close coincidence in the absence of any sub-basal light rusty bar to the fur on the back. I have, however, found some specimens from the lower Rio Grande of Texas which I consider much nearer the true *L. bachmani*, and, as they are widely different from the subject of the present article, I have no alternative but to impose upon it a new appellation. I have therefore given it the name of John James Audubon, the world-renowned naturalist, artist, and author—the honored teacher, friend, and benefactor of the writer of these pages.

The species I here describe appears to be restricted to the coast of California, as, of the numerous small hares in the collection before me, from Texas and New Mexico, all belong to another species. It is possible that, in referring to *Lepus bachmani* as abundant in Texas, Audubon and Bachman had this other species in view, which I have considered the same with *L. artemisia*.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—	
							Nose to occip.	Nose to tail.	Tail to end of verteb.	Tail to end of hairs.	Length of hind foot.	Length of skull.	Width of skull.	Height of ear, ant.		Height of ear, post.
309			Presidio, Cal.....	.....	Lt. W. P. Trowbridge.	Skin	3.00	14.50	1.50	2.25	3.17	.....	.....	2.75	3.08	.....
1163	2045	.....	San Francisco, Cal.....	.....	Lt. Williamson	do.....	3.20	15.00	.....	.....	3.05	2.66	1.34	3.00	.....	Dr. Newberry..
1591			San Diego, Cal.....	Feb. 19, 1856	Dr. J. F. Hammond ..	do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1594		♀	do.....	Dec. 28, 1855	do.....	do.....	3.33	14.50	.....	3.15	.....	.....	.....	2.80	.....	.....
1596		♂	do.....	do.....	do.....	do.....	.....	11.00	.....	2.00	...	.....	.....	.....	3.25	.....

LEPUS TROWBRIDGII, Baird.

Lepus trowbridgii, BAIRD, Pr. A. N. Sc. Phila. VII, April 1855, 333.

SP. CH.—Size small, less than of *L. auduboni*. Head small. Ears about equal to it in length. Tail very short, almost rudimentary; hind feet very short, well furred, considerably shorter than the head. Color above, yellowish brown and dark brown, beneath, plumbeous gray. Sides not conspicuously different from the back, but paler. Back of neck pale rusty. Ears grayish and black on the external band; ashy gray elsewhere, with little indication of darker margin or tip.

No. 310. Size considerably smaller than *L. sylvaticus*. Head small, orbit small. Ears about as long as the head. Tail very short, almost rudimentary. Hind feet very short, densely furred. Fur of moderate length, softer than in *L. sylvaticus*.

The upper parts generally are yellowish brown, paler than in *L. sylvaticus*, mixed with dark brown (not black). The sides, with the throat and chest, are paler, not conspicuously different from the back. The prevailing tint of the under parts is ashy, mixed with lead color and gray, the former predominating; the under part of the head ashy gray. The sides and the tip of the snout are ashy. The nape and back of the neck are light rufous; a very slight tinge of the same on the legs and upper surface of the hind feet, which are whitish. The ears are quite plainly colored. On their dorsal surface they are rusty at the extreme base, then ashy; the external bands mixed gray yellowish, red, and brown, the prevailing tint, however, grayer than on the back. There is very little, if any, indication of a duskier margin anteriorly, where the fringe is grayish. On the concavity of the ear the hairs generally are grayish; somewhat variegated on the internal band.

The fur is everywhere lead color or dark ash at the base; on the back generally it shades into a kind of chestnut brown; it is then yellow brown and slightly tipped with brown. The sub-terminal dark ring is thus a chestnut brown, not black as in *L. auduboni*, and has a lighter shade of the same between it and the ash color. On the sides the arrangement is somewhat

similar, but the shades are paler and the basal lead color more extended. Beneath, the hairs are principally lead color, but pass gradually into ash gray. The tail is dark brown with ashy and rusty tips to some of the hairs; the under surface at the base is white, very little conspicuous.

Another specimen (311) from the same locality is smaller and the colors purer. The rufous on the back of the neck is paler and there is less on the hind legs. The sub-terminal dark bar on the back is very dark brown, separated from the basal lead color by a faint, rusty tint. On the sides this bar is lighter, and that separating it from the lead color is broader and more distinct. The ears are similar, with a rather duskier margin anteriorly.

In a third specimen (312,) from the same locality, still smaller, the back of the neck is still paler, being, in fact, almost grayish in the middle. The basal lead color of the hairs on the back is still more extended and the throat more rusty. The belly is rather more silvery.

The three specimens of this very curious little species were collected somewhere on the coast of California, by Lieutenant W. P. Trowbridge. They come from Monterey or San Francisco, immediately on the coast. The lead color or ashy gray of the belly is quite peculiar among American rabbits, not having been observed in any other species. The very short hind feet are also peculiar. In these characters it is readily distinguished from others of the same size. Its closest alliance is to *L. auduboni*, as described in this report; from this it is distinguished by the shorter and uncolored ears, very short tail, shorter hind feet; less black in the dark markings, the fur on the back passing from lead color through pale rusty to brown, &c.

A large additional series of specimens received since the preceding description was prepared, verify the claims of this species and enable me to extend somewhat the account of it. The most perfect of these (from Santa Clara, California, 1183,) is rather darker on the back; the band on the throat is very broad and is entirely destitute of any rufous tinge, the color being like the sides, or a yellowish brown gray lined with black.

In winter the fur appears a good deal longer, and the preponderance of black is so great as almost to impart this hue to the back.

There seems to be a good deal of difference in the length of the ears, although these always maintain the character by which they are distinguished from *L. auduboni*, the species with which they are associated, namely, the absence of any black edging to the tip of the ear. The feet and tail are always much shorter, and the under parts much less pure white.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								Collected by—				
							Nose to eye.	Nose to ear.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Length of fore ft.	Length of hind ft.		Length of skull.	Width of skull.	Ht. of ear ant'ry.	Ht. of ear post'y.
1871	1871	♂	San Francisco		Lt. W. P. Trowbridge	Skull								2.52	1.25				
1872	1872	♂	do		do	do									1.21				
310	1235	♂	S. Francisco, or Monterey	1853	do	Skin	1.42	2.58	2.66	13.00	.42	.84	2.66				2.33		
311		♂	do	1853	do	do	1.25	2.43	2.50	12.17	.50		2.75				2.35	2.33	
312		♂	do	1853	do	do	1.08	2.08	2.25	11.00	.42	.84	2.08						
705		♂	San Francisco, Cal.		do	do													
706		♂	do		do	do											2.55		
707		♂	do		do	do							2.77				2.50		
1171		♂	do		Lt. Williamson	do		2.80	12.50				2.68				2.53		} Dr. New berry. T. A. Szabo
559		♂	Bodega, Cal.		Lt. Trowbridge	do		3.03	14.50				2.98				2.28		
1183		♂	Santa Clara, Cal.		Dr. J. G. Cooper	do		3.20	15.00				2.30				2.63		
2974		♂	Petaluma, Cal.		E. Samuels	Skin, in al.	1.46	2.53	2.92				1.46	2.98			2.78		
2975		♂	do		do	do	1.41	2.45	2.85				1.46	2.93			2.65		
1590		♂	San Diego, Cal.	Mar., 1856	Dr. J. F. Hammond	Skin		2.70					2.60				2.70		
1592		♂	do	Feb. 19, '56	do	do		3.10					2.60				2.62		
1593		♂	do	Feb. 27, '56	do	do		2.99	12.00				2.69				3.06		

LEPUS AQUATICUS, Bachman.

Water Rabbit.

Lepus aquaticus, BACHMAN, J. A. N. Sc. Phila. VII, II, 1837, 319; pl. xxii, f. 2.—IB. VIII, I, 1839, 78.

WATERHOUSE, N. H. Mamm. II, 1848, 112.

AUD. & BACH. N. Am. Quad. I, 1849, 287; pl. xxxvii.

Lepus douglassi, var. 1, GRAY. Charlesw. Mag. I, 1837, 586.

SP. CH.—Considerably larger than *L. sylvaticus*. Head and incisors very large. Ears scarcely half the head; hind feet shorter than the head; pointed; the claws uncovered. Tail as long as the ears. Color above, yellowish brown, closely lined with black. Sides grayer. Tail above, rump, and legs, chestnut rusty brown. Tail beneath, and belly, cottony white; a black spot on the forehead. Under fur on the anterior portion of the back, without any yellowish brown tip.

This species possesses many of the peculiar characteristics found in *L. palustris*, but differs by several strongly marked characters. Like it, it is aquatic in habits, and the hind feet exhibit the same slenderness, owing to the reduced depth of the pads; they are pointed at the toes, instead of being bluntly truncated, and the claws are all distinctly visible.

This animal is of very large size, scarcely inferior in weight even to our western hares; it is certainly larger than *L. americanus*. With this bulk, the very short hind feet and ears give to it a very peculiar appearance. The head and incisor teeth are enormously large in proportion, the latter especially. The ears are very short, but little more than half the length of the head; they are very broad, and rounded at the apex. They are well covered with rather long hairs, not very compactly arranged. The feet are very short, considerably less than the head. The pads are scanty, and the terminal portion of the foot is acute; the claws visible from above. The tail is rather unusually long, with the hairs, equalling, or exceeding the ears.

The fur is very coarse and harsh, owing to the length and predominance of the bristly hair.

The predominant color of the upper parts and sides is a light yellowish brown, but so much overlaid with black as to have this very prominent. In some specimens the black is much aggregated; in others it is more uniformly distributed. The sides are considerably paler, with

less black. The rump, upper surface of the tail, outer and anterior surfaces of the feet, are dark chestnut brown. The under half of the tail, the belly, and the under surface of the head, with the lower part of the chin, are pure cottony white; the band across the lower part of the throat is light yellowish brown. There is a black spot in the middle of the forehead between the anterior base of the ears. The ears are hoary gray in their concavity, the margin of which, however, is yellowish brown. The anterior band is grizzled like the back; the rest of the back of the ear is dull ashy. There is much black on the sides of the head, sometimes aggregated into a broad patch on the cheeks.

The under fur on the back, anteriorly, is lead gray, tinged with sooty at the tip. Towards the rump, however, there is an infusion of yellowish brown in the tips. The bristly hairs are black, with a median bar of yellowish brown. There is the usual chestnut brown patch on the nape.

This species is readily distinguished from *L. sylvaticus* by its disproportionably larger head and incisors and its absolutely larger size. The ears and hind feet are shorter, the latter much thinner and more pointed. The tail is longer and narrower. The colors are somewhat similar, but there is much more black on the back and head. The rump and legs are much redder, and the fur on the anterior portion of the back lacks the yellowish brown tip.

This species is very similar in many characteristics to *L. palustris*, as in the short ears, and short and slender hind feet, disproportionate size of skull and incisors, &c. The size is, however, much larger; the tail much longer; the under parts of tail and belly pure cottony white, &c.

Measurement of skull.

Skull.	No. 1228.		Skull.	No. 1228.	
	Inches and 100ths.	100ths of length.		Inches and 100ths.	100ths of length.
Total length to end of nasals.....	3. 40	1. 00	Upper incisor, height.....	. 34	. 10
Greater width.....	1. 61	. 47	width between external edges.....	. 24	. 07
Distance between ante-orbital notches...	. 84	. 24	Upper molars, length taken together...	. 66	. 19
Nasal bones, length.....	1. 46	. 43	distance between.....	. 43	. 13
width behind.....	. 66	. 19	Lower jaw, length.....	2. 80	. 82
width before.....	. 51	. 15	height.....	1. 65	. 49
Upper incisors from front to molars.....	1. 14	. 34	arc.....	2. 68	. 79
from front to hinder margin of palate.....	1. 52	. 45			

This measurement was made with a less accurate rule than that used for the table in the introductory article.

It is a question whether Dr. Bachman and Waterhouse are correct in their identification of the *Lepus aquaticus* of Bachman with the *L. douglassi*, var. 1 of Gray. Waterhouse gives a much more elaborate description of Gray's specimen than the author does; in the course of which he mentions that the ears are *rather* shorter than the head; the abdomen rufous yellow,

inclining to white; ears internally clothed with yellow hairs, becoming almost rufous at the point; the back of the ear bright rusty yellow, like the back of the neck, except the apex, which has a distinct though smallish black patch, with a black line running down the hinder margin; the extreme edge of the ear rufous yellow; tail pencilled with white and dirty yellow below. Hairs on the back pale gray at root, then pale brownish yellow, then black, then a subterminal broad brown-yellow ring, and a black tip. On the abdomen, hairs white, with a very indistinct trace of gray next the skin. Length to root of tail, 17 inches; to ear, 3.60; of ear, 3.25; width of ear, 2.25; length of hind feet, 4.00; of tail, including fur, 3.00.

I have before me eight specimens of *Lepus aquaticus* from various localities in Louisiana and Mississippi, and all agreeing very well in character. In all these the abdomen and under surface of the tail are pure white; the interior of the ear is hoary gray, (not yellow,) becoming yellowish brown towards the exterior; the back of the ear is dusky, with a tinge of hoary plumbeous; a small patch of hoary near the base behind. There is a faint dusky edge to the tip of the ear on the dorsal surface, but nothing like a black patch; nor is there a black line running down the hinder margin. The bristle hairs of the back are black, with one annulation of yellowish brown, not two. The hairs on the abdomen are grayish plumbeous for their basal half, instead of nearly pure white to the roots. The ears are *considerably* shorter than the head. For these reasons, therefore, I have little hesitation in separating *L. douglassi* No. 1 from *L. aquaticus*, although I do not know where to refer the first named species. Its locality is supposed to be in Texas.

This species and the next have the striking peculiarity of living near the water in swampy or marshy places, and of swimming and diving without hesitation when pursued. Full accounts of their habits, in this and other respects, will be found in the papers by Dr. Bachman, and in the work on the Viviparous Quadrupeds of North America.

The *Lepus aquaticus* appears to be most abundant in the swampy tracts bordering the Mississippi river, in Louisiana and Mississippi. Mr. Kennicott mentions a "swamp rabbit" as occurring in the wet grounds of New Madrid, Missouri, which, if this species, as is quite probable, would give it a considerable range to the north. There is some doubt of its being found in the southern part of Texas. It has not yet been found in the southeastern States.

List of specimens.

Catalogue number.	Corresponding number of skull.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.								
						Nose to eye.	Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Hind foot, length.	Skull, length.	Skull, width.	Height of ear anteriorly.
697	.....	Garlandeville, Miss	April, 1855	Mr. Robinson.....	Def. skin..	.....	3.25	19.00	.....	.....	.....	.....	.....	3.10
251	1203	Mississippi .....	.....	Col. B. L. C. Wailes.	Skin .....	.....	.....	15.50	.....	.....	3.65	.....	.....	2.98
2306	.....	Prairie Mer Rouge, La....	Winter....	Jas. Fairie.....	do.....	.....	4.10	17.50	1.60	2.40	4.07	.....	.....	3.00
2307	.....	do	do	do	do.....	.....	3.85	20.50	1.75	2.68	3.88	.....	.....	2.88
2308	.....	do	do	do	do.....	.....	3.50	19.00	.....	.....	4.20	.....	.....	.....
2309	.....	do	do	do	do.....	.....	3.90	19.00	2.20	2.81	3.75	.....	.....	2.88
2310	3133	do	do	do	do.....	.....	.....	17.00	.....	.....	3.68	3.32	1.55	2.75
291	1228	Calcasieu, La .....	.....	G. Wurdemann....	Skin ¹	1.84	3.33	16.00	2.08	2.92	4.08	3.55	1.63	2.66

¹ The tibia measures 4.50; the longest hind claw, .58.

LEPUS PALUSTRIS, Bachman.

Marsh Rabbit.

Lepus palustris, BACHMAN, J. A. N. Sc. Phila. VII, II, 1837, 194, 336; pl. xv, xvi.—IB. VIII, I, 1839, 79.

AUD. Birds Amer. IV, 510; plate.

WATERHOUSE, N. H. Mamm. II, 1848, 119.

AUD. & BACH. N. Am. Quad. I, 1849, 151; pl. xviii.

Lepus douglassi, var. 2, GRAY, Charles. Mag. N. H. Nov. 1837, 586.

SP. CH.—About the size of the common gray rabbit. Head and incisors disproportionately large. Ears scarcely two-thirds the length of the head; without any gray or black. Hind foot shorter than the head, acute at the toes, the nails all visible. Tail very short, and not cotton-white beneath. Fur coarse and bristly. Above, pale grayish yellow brown, much covered and lined with black on the back and head. Rump, upper surface of tail and outer surface of leg dusky rusty. Beneath, grayish or ashy white.

This is one of the most peculiar of all the American hares, on account of its short and thinly furred hind feet, very large head, short tail, &c. It is really larger than *L. sylvaticus*, but the head is disproportionately greater than in this species.

As just stated, the head is very large, the skull longer, the incisors much broader and more massive than in *L. sylvaticus*, or nearly one-third larger. The nose is large; the fissure of the upper lip narrow. The ears are very short; scarcely two-thirds the length of the head; they are broad and much rounded at tip; more so than in *L. sylvaticus*; the ear itself considerably shorter. The hair on the ear is rather coarse and scant.

The feet are very small and weak for the size of the animal, the hinder ones especially, the length of which is considerably less than that of the head, and but little longer than the ear. Owing to the shortness of the hair forming the pads on the sole, the hind feet appear very thin and slender, and are acutely pointed at the toes; the nails almost entirely uncovered. In the slender and pointed character of the feet, the resemblance to an Agouti is quite striking. The tail is very short, scarcely half the length of the ear, and forming only a slight prominence at the rump.

The fur is very coarse and bristly, the bristle hairs stiffer and more abundant than in *L. sylvaticus*, especially in the winter.

The colors of this species exhibit very little of the contrasts of the wood rabbit, the white being much less pure. The upper parts are of a dull obscure yellowish brown, lighter on the sides of the body, rather more reddish on the middle of the back, where the light color is much overlaid with black tips to the hairs. There is a strong tinge of dull rusty brown on the rump and exterior of the limbs. The band on the throat is like the sides; the belly, and under the head, are of a dull grayish ash, or whitish ash. The sides of the head are rendered very dark by a uniform mixture of black tips to the hairs. There is a slightly lighter shade around the eye. There are no light patchings or edgings to the ear, which is of a dirty yellowish brown, lined with blackish, with a slight tinge of rusty on the outer band, nor is there any dusky line or patch. The pads of the feet are dull brownish; the tint above is dark rusty, beneath it is pale whitish brown. The nape is of a uniform brownish chestnut, not very conspicuously different from the surrounding fur.

Winter skins differ in a greater length and coarseness of the bristly hairs, which have so

much black as almost to form a continuous tint on the back, with only a slight break here and there. There is also a greater amount of black on the cheeks. The white of the under parts is rather purer.

The slightest comparison of specimens of this species with *sylvaticus* will show the very great differences between them. Of approximately the same size, the head and incisors are very much larger; the hind feet, ears, and tail much shorter; the former very slender and acutely pointed. The colors are very different, in the absence of the light yellowish red, or light reddish brown of the back, and in having the rump dark rusty instead of gray. The under parts lack the clear cottony white of the other species, especially under the tail. The under fur of the back is entirely of a uniform dark smoky gray, except towards the rump, where it is tipped with paler. The bristly hairs of the back, which in winter are an inch and a half long, are entirely of a glossy black, with a subterminal annulus of yellowish brown about a quarter of an inch long, and about that distance from the tip. The anterior face of the hind legs is rusty. In *Lepus sylvaticus* the under fur is of a much paler plumbeous, with a well defined broad tip of yellowish brown. The long hairs of the back are much shorter, the black much more restricted, the yellowish brown median annulus much more extended. The anterior face of the hind legs is nearly white.

The differences from *L. aquaticus* have already been given under the head of that species, where, also, will be found a reference to its peculiar habits.

This animal is found in the south Atlantic States, from North Carolina (according to Bachman) to Georgia and Florida. Audubon and Bachman mention it as occurring in Louisiana and Texas. I have never seen any specimens from the regions west of Georgia, and should be much inclined to doubt the correctness of Texas as a locality.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements. ¹								
							Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	Fore foot, length.	Hind foot, length.	Skull, length.	Skull, width.	Ear, height.
1255	2086	.....	Society Hill, S. C.....	Winter....	M. A. Curtis & Sons....	Skin	3.65	14.50	.....	.....	.....	3.33	3.05	1.49	2.50
1254	2089	.....	do.....	do.....	do.....	do.....	3.80	15.00	.....	.....	1.72	3.77	3.20	1.50	2.32
1256	.....	.....	do.....	do.....	do.....	do.....	3.10	12.50	.98	1.78	.....	3.60	.....	.....	2.30
1613	.....	♂	St. Simon's island, Ga.....	.....	Dr. S. W. Wilson	do.....	3.60	17.00	.75	1.50	.....	3.20	.....	.....	2.60
1614	2459	.....	do.....	.....	do.....	do.....	.....	.....	.....	.....	.....	.....	3.15	1.49	.....
1615	2461	.....	do.....	.....	do.....	do.....	3.50	16.00	.65	1.45	.....	3.50	3.10	1.55	.....
1616	.....	♂	do.....	.....	do.....	do.....	3.38	18.00	.....	.....	.....	3.35	.....	.....	2.45
1619	2462	♂	do.....	.....	do.....	do.....	3.48	16.50	.....	.....	.....	3.40	3.20	1.55	2.38
1620	.....	.....	do.....	.....	do.....	do.....	3.45	17.00	.....	.....	.....	3.50	.....	.....	.....
1621	.....	.....	do.....	.....	do.....	do.....	3.65	17.00	.....	.....	.....	3.40	.....	.....	2.27
1211	2057	.....	do.....	.....	J. P. Postell	do.....	.....	16.50	.....	.....	.....	3.45	3.07	1.50	2.35

¹ The following are additional measurements of skulls from St. Simon's island, Ga: 2203, 3.04 + 1.50; 2204, 3.25 + 1.50; 2205, 3.16 + 1.51; 2206, 3.15 + 1.54; 2207, 2.97 + 1.45; 2453, 3.17 + 1.60; 2454, 3.03 + 1.45; 2455, 3.14 + 1.55, &c. The usual range is from 3.05 to 3.20 for length, and 1.46 to 1.62 for width.

In addition to the species of hares which I have characterized above, there are two or three others which the materials before me do not permit me to describe or discuss. These are as follows:

LEPUS TEXIANUS, Aud. & Bach. Texas.

? *Lepus texianus*, (AUD. & BACH.) WATERHOUSE, N. H. Mamm. II, 1848, 136.

AUD. & BACH. N. Am. Quad. III, 1853, 156; pl. cxxxiii.

SP. CH.—Larger than the Californian hare; ears very large; a dark brown stripe on the top of the neck, and a black stripe from the rump, extending to the root of the tail and along its upper surface to the tip. Upper surface of body mottled deep buff and black; throat and belly, white; under side of neck, dull rufous. A black patch on the inner surface of the ear at its base; anterior margin of ears, buff; posterior portion of the ear, for an inch and half from tip, whitish; extreme tip of the ear with a brown margin. Length to root of tail, 21 inches; to ear, $4\frac{1}{2}$; ear, externally, $6\frac{1}{2}$; tarsus, 5 inches; tail $4\frac{3}{4}$.

The distinctions of this species from *L. callotis* are not well defined. The color seems to approximate to that of *L. californicus*; nor is there any mention made of the gray rump of *callotis*. There are strong grounds for considering this as distinct from either of the above mentioned species. The *Lepus texianus* of Waterhouse, however, appears entirely different from the animal of Audubon and Bachman. It is described as having the fur long and soft; the color pale, inclining to ashy gray, but strongly mottled with black and brownish white on the upper parts of the body; the throat and abdomen, white; haunches and outer surface, gray; tarsus, nearly white; back of neck, pale ashy gray; tail black above, grayish beneath; a large black patch on the rump; ears with a large black patch at the apex externally. Length, 20 inches; ear, 6.50; tarsus, 5.00; tail, 4.

The hairs on the upper parts of the body are white (very slightly tinted with gray) at the root, brownish towards the middle, black above the middle; with a broad, sub-terminal, almost white ring, shaded into reddish near the black tip.

This animal of Waterhouse resembles very closely the pale-naped varieties described of *L. callotis*, very much more than *L. texianus* of Aud. & Bach. Should it be distinct from either this or *callotis*, it must take priority over the former, (1848 to 1853,) which would then require a new name.

LEPUS NUTTALLI, Bachman. Columbia river.

Under the head of *L. artemisia*, I have already given the synonymy of this species, which I strongly suspect to be an immature specimen of the same. Should the identity be positively ascertained, the name of *L. nuttalli* must take precedence as prior in point of date.

LEPUS CUNICULARIUS, Lichtenstein. Mexico.

Lepus cunicularius, (LICHTENSTEIN,) WATERHOUSE, N. H. Mamm. II, 1848, 132.

“Probably allied to the short-eared hares of the United States. Fur said to be short and coarse; the general hue of the upper parts of the body brownish black; the hairs on these points being pale ashy gray at the root, light brown in the middle, annulated with yellowish white towards the point, and with a long black point. Ears internally clothed with short cream colored hairs; externally pale gray brown, but assuming a blackish hue towards the tip; back of the neck, yellow; orbit of the eye, throat, and abdomen, white. Length to root of tail, 15.50 inches; of tail, 2.75; of ear, 3.42; of tarsus, 4.00.”

This species from Mexico, which must be considerably larger than *L. sylvaticus*, appears to have been merely named by Lichtenstein in the Berlin museum, and notes in manuscript made by Dr. Bachman, and communicated to Waterhouse. May not this be the *Lepus douglassii*, var. 1, of Gray, mentioned under the head of *L. aquaticus*?

LEPUS DOUGLASSII, var. 1. Gray. Mexico?

A reference to this species will be found under the head of *L. aquaticus*, page 613.

LAGOMYS, Cuv.

Lagomys, "CUVIER, Tableau élémén. 1797."

No visible tail ; ears short and rounded ; hind legs short. Molars $\frac{5-5}{5-5}$.

The species of this genus are small, the largest not exceeding a Guinea pig in size. They are confined to the northern hemisphere, and generally occur in elevated districts. But one species is found in North America ; this, within the limits of the United States, occurs in the region of the Rocky mountains, near the British line, north of which it is more abundant. Others occur in Siberia, as well as in central Asia.

In general appearance the pikas, as they are called in Siberia, bear a not inconsiderable external resemblance, both in shape and color, to the wild Guinea pigs (*Caviae*) of South America, some of which, too, have the same habit of being among almost Alpine altitudes. This is especially the case with the *Cavia australis*, which in the high regions of Uspallata is found in great numbers, and is known as the mountain rabbit.

"The pikas present other important differences from the hares besides those above referred to. Thus the skull is more depressed and more dilated behind ; the interorbital space more contracted ; the supra-orbital process is wanting ; the orbits are directed more upwards ; the malar bone is prolonged behind greatly beyond the zygomatic process of the temporal, reaching, in fact, nearly to the opening of the ear chamber. Instead of the numerous perforations of the nasal process of the superior maxillary bone of the hares, there is but one chief opening in the same bone in *Lagomys*. Viewing the skull from below, the bodies of the sphenoids and the vomer are brought nearer to the plane of the palate than in the genus *Lepus*. The posterior sphenoid wants the mesial perforations, and the openings on either side of this bone are smaller ; the vomer joins the anterior sphenoid, while in the hares an oblong opening separates the bodies of these two bones. The incisive openings are sometimes separated from the middle or chief palatine openings, but in some species the openings are confluent, as in the hares. The occiput is broader than high, and the zygomatic arch remarkably short.

"In the lower jaw the chief differences consist in the smaller antero-posterior diameter of the angular portion, and in the condyloid portion being sloped less backwards ; the long thin plate representing the coronoid process in the true hares is in the pikas replaced by a small tubercle, and there is a second still smaller tubercle placed just below the one just mentioned, and, in fact, but little removed from the posterior molar teeth. The mental foramen, instead of being placed in the fore part of the jaw, is situated near the middle of the outer surface of the horizontal ramus.

"The principal incisor teeth in the upper jaw are broad, but have a very small antero-posterior diameter ; each of these teeth has a deep vertical groove on the outer side, and terminates in two points, there being a strong notch at the extremity. The lower incisors are simple, and smaller than the upper. The upper molars are much as in the hares ; they have the same three transverse ridges of enamel, but on the hinder part of the last molar an extra loop is visible, which is placed nearer to the inner than to the outer angle of the tooth ; this molar corresponds to the penultimate molar of the hare. The lower molars have the grooves in the

side deeper than in the hares; the body of the tooth is therefore more contracted in the middle, and the salient angles of the two halves of the tooth are more prominent; the foremost molar, as in the hares, has two grooves on the outer surface; the last molar has but one salient external and internal angle, and in bulk does not equal half of one of the preceding molars.

“Small naked pads at the ends of the toes have been noticed amongst the distinguishing characters of *Lagomys*, but in two Old World species these can scarcely be traced; excepting these pads, the soles are densely clothed with fur.”—(*Waterhouse*.)

LAGOMYS PRINCEPS, Rich.

Little Chief Hare.

Lepus (Lagomys) princeps, RICH. Zool. Journal, 1828, 520.—IB. F. B. A. I, 1829, 227; pl. xix.

BACHMAN, J. A. Nat. Sc. VII, 1837, 354.

Lagomys princeps, WATERHOUSE, Nat. Hist. Mamm. II, 1848, 28.

AUD. & BACH. N. Am. Quadrupeds, II, 1851, 244; pl. lxxxiii.

SP. CH.—“General hue of the fur on the upper parts of the body, grayish; but these parts are strongly pencilled with black and yellowish white. On the sides of the body, yellowish brown, and on the under parts dirty white, considerably suffused with pale brown yellow. Feet white, tinted with yellow on the upper surface. Ears rather large, with a distinct white margin.

“Total length, 7 inches. Ears 8 lines long, 10 lines wide. Fore foot and nails, $8\frac{1}{2}$ lines; hinder foot, 1 inch $2\frac{1}{2}$ lines.”—*Waterhouse*.

No specimens of this species were brought in by any of the recent expeditions, and I have made use of the one collected in the South Pass of the Rocky Mountains by Townsend, now in the collection of the Philadelphia Academy, for the purpose of description. It is not in very perfect condition, however, lacking entirely the lower jaw, and being mounted in such a manner as not to allow any minute examination of its characters. The diagnosis of the species I have taken from *Waterhouse*, as giving its distinctive features as compared with the Old World *Lagomys*.

The size appears to be about that of a Norway rat, rather shorter and stouter, perhaps. The incisor teeth are stout, about eight-hundredths of an inch in width each. Their anterior face is deeply grooved, the greatest depth being on the anterior third, and rounding gradually from this to the exterior edge. The muffle is too much distorted for description, although it appears to be like that of a rabbit. The ears are considerably shorter than in *Lepus*, broad and rounded above, in shape not unlike those of *Neotoma cinerea*. Their posterior face is covered with long, silky fur, the concavity concealed by long bristly hair. The tail is entirely wanting. The feet are short, thin, and depressed. The fore foot has a large thumb claw, situated above the level of the remaining four. The hind feet have four toes, the central rather longest. The claws of both feet are large and much curved; the hind ones especially are curved, instead of being almost straight as in *Lepus*. The bases of the claws are all more or less overgrown and concealed by stiff curved bristles, springing from the upper surface. The under surface of the feet is covered densely with rather short stiff bristly hair, the bulbs of the toes above being entirely naked. There are thus four naked pads on each foot, perhaps a fifth under the thumb of the fore foot, although this cannot be determined in the specimen. The fur is long and full, composed of stiff, rather bristly, hairs, without any under fur at all. The longest of these hairs on the back measures about three-quarters of an inch.

The general appearance of the animal as to color is that of a young rabbit. The upper parts and sides are light yellowish brown, relieved by dusky points to the hairs, especially on the back and loins, and passing on the rump into a grayish tinge. The region around the anus, the feet, and the under parts generally, are dull yellow brownish, or pale rufous white. The silky hairs on the back of the ear are the color of dirty cotton; anteriorly, more dusky. The ears are narrowly margined with white. The hairs of the back are lead colored for their basal two-thirds.

The estimated length of the animal is 8 inches. Hind foot from heel $1\frac{2}{10}$ inches. The ear is about an inch high. Collected in the South Pass by Townsend.

Mr. Townsend, in his adventurous journey across the continent to the mouth of the Columbia, obtained the single specimen just described, and, as far as I know, the only one ever taken within our limits. They are met with in "about latitude 42° , high up on the alpine region of the ridges dividing the waters of the Columbia, Colorado, and Missouri, (in the South Pass of the Rocky Mountains,) hiding among loose piles of rocks or stones, such as are generally seen beneath broken cliffs. They uttered a slender but distinct bleat, much like that of a young goat."

According to Richardson, this species inhabits the Rocky Mountains as far north as $60^{\circ} 4'$ north latitude. It is not known whether, like the other pikas, the "little chief" lays up a store of winter provisions, although this is quite probable.

ORDER IV.

E D E N T A T A .

Teeth simple, or none at all ; always wanting in the anterior part of the jaws.

The *Edentata* of modern authors correspond to the *Bruta* of Linnæus, which embraced, however, several genera to which the diagnosis, as above given, does not apply. Setting aside these, (*Trichechus*, *Elephas*, and *Monodon*,) we have left, as constituting the *Bruta* of Linnæus, *Bradypus*, *Myrmecophaga*, *Manis*, and *Dasypus*, to which more recent authors have added *Choloepus*, *Chlamydophorus*, *Orycteropus*, &c., together with *Echidna* and *Ornithorhynchus*. These constitute the principal living genera of *Edentata*, but there are several extinct ones to be added to the list, as *Megalonyx*, *Megatherium*, *Mytodon*, &c.

The genera of *Edentata*, though few in number, are yet so different from each other as to admit of being arranged in three families, *Bradypoda*, *Effodientia*, and *Biclaviculata*.¹ These may be briefly characterized as follows:

I. BRADYPODA.—With canine and molar teeth. Malar bone with an additional inferior process. Stomach divided. Anterior limbs very long. Mammaræ, pectoral. Tail very short, or wanting. Fur dry and coarse.

Of this family, embracing the sloths proper, no representatives are found in North America.

FAM. 2. EFFODIENTIA.—Teeth uniform, or none. Malar bone simple, or wanting. Muzzle elongated. Limbs short, stout ; the hinder ones longest. Stomach simple.

This family, embracing the armadillos as the most prominent form, has one living representative in North America, *Dasypus novem-cinctus*, found abundantly on the lower Rio Grande of Texas.

FAM. 3. BICLAVICULATA, or MONOTREMATA.—Clavicles double. Mammary papillæ, wanting. Well developed marsupial bones. Cloaca simple. Males provided with spurs to the feet.

This family embraces two very extraordinary forms of animal life, the *Echidna* and the *Ornithorhynchus*, both natives of Australia.

It is proper to state that high authority, such as that of Waterhouse and others, place the *Monotremata* at the end of the *Marsupialia*.

There is a very striking contrast between the *Effodientia*, as characterized above, and the *Bradypoda*.

In the latter, the structure of the animal is adapted to a residence upon trees, and it is only exceptionally that the sloths are found on the ground. In the armadillos, on the other hand, the solid covering, and the long fossorial claws, indicate a terrestrial habitat, and that rather beneath than above the surface. The food of the two groups is equally diverse ; that of the sloths consisting of the leaves and twigs of trees, while the armadillos seem created especially to keep in check the myriad insects of tropical regions, and especially the ants, the most abundant of all.

¹Wagner, Suppl. Schreber, IV, 130.

More active than the sloths, the armadillos are, nevertheless, ill fitted for rapid progression, although they move with comparatively great quickness through loose soil. The limbs are short and stout; the hinder ones longest; the claws are long and well fitted for digging. The muzzle, which in sloths is very short and blunt, is here elongated, sometimes to a very great degree. Teeth are sometimes present, sometimes entirely wanting; in the former case they consist entirely of molars. A single species only has a tooth on either side of the upper jaw, which, from its implantation in the intermaxillary, is to be considered as an incisor, although in shape and lateral position it agrees altogether with the molars. The malar bone is simple, or else entirely wanting. The stomach is not compound. The external covering consists either of hair, of bony plates, or imbricated scales, but however varied in this respect, the internal structure exhibits a marked conformity in the different genera. Their food consists of insects and worms, obtained mostly by digging.¹

There are two divisions of this family, one embracing genera with teeth, as *Dasypus*, *Chlamydophorus*, and *Orycteropus*; the genera of the other are entirely destitute of teeth in both jaws, as *Myrmecophaga* and *Manis*, which are thus true *Edentata*, in the strictest sense of the term.

¹Wagner, Suppl. Schreb. IV, 1844, 160.

DASYPUS, Linnæus.

Dasypus, LINNÆUS, "Syst. Nat. (ed. 2,) 1740."

Edentata, with a solid bony carapace, divided centrally into a varying number of movable zones. Molar teeth numerous, simple; ears distinct.¹

The armadillos, with their coat of bony mail, constitute a remarkable feature in the zoology of the continent of America, to which they are confined. The skeleton presents many conspicuous points, as compared with most other mammals. The skull is a cone, drawn out into a narrow muzzle at one end, subtruncate at the other, without any temporal crest. The teeth are very simple, and of a firm uniform material, consisting of ivory or dentine, with usually a thin coating of cement. Canine and incisor teeth are wanting; in *Dasypus sexcinctus* alone is there an incisor on either side at the extremities of the jaws, although these, by their lateral position, take their place with the molars, without differing in any way from them. The number of teeth varies from 32 or 34 in *D. longicaudatus*, to 92-98 in *D. gigas*, the largest number to be found among the terrestrial mammalia. The shape of the teeth varies with the species.

By some authors, the genus *Dasypus*, as above constituted, is considered as a family, with several genera, of which *Cheloniscus*, *Xenurus*, and *Euphractus* have the fore feet five-toed, while *Tolypeutes* and *Dasypus* have only four toes anteriorly. It is in the restricted genus *Dasypus* that our North American species falls.

DASYPUS NOVEM-CINCTUS, Linnæus.

Texas Armadillo.

Dasypus novem-cinctus, LINNÆUS, Syst. Nat. (ed. 12,) I, 1766, 54.

SCHREBER, Säugt. II, 1775, 223; tab. lxxiv and lxxvi.

WAGNER, Suppl. Schreb. IX, 1844, 179.

GIEBEL, Säugt. 1855, 421.

Dasypus octo-cinctus, (LINN.) SCHREBER, Säugt. II, 1775, 222; tab. lxxiii and lxxvi.*Dasypus peba*, DESM. Mamm. II, 1822, 368.

AUD. & BACH. N. Am. Quad. III, 1853, 220; pl. cxlvi.

? *Dasypus longicaudatus*, "PR. MAX. BEIT."

SP. CH.—Eight molars on each side of each jaw; none of them implanted in the intermaxillary. Tail as long as the body, exclusive of the head, or a little longer. Eight movable rings in the middle of the shell, and a ninth partly free on the sides. Tail covered with twelve jointed whorls to near the end, where it is plaited and imbricated, but not enveloped by a horny cone. Molars, thirty-two. Color, blackish.

A detailed description of this animal will be found in the zoological report of the United States and Mexican Boundary Survey, from specimens preserved in alcohol. There is some uncertainty as to the precise name of the Texas species, on account of the probable combination of more than one under the same name in South America. Lund, in endeavoring to settle the question, gives three species as most closely allied, in the following diagnoses:

D. novem-cinctus, Linn. (*D. longicaudatus*, Max.) Largest species; with seven molars, nine bands, and a tail the length of the body. Inhabits Cayenne and northern Brazil.

¹Wagner, Suppl. Schreb. I, 1844, 160.

D. octo-cinctus, Linn. (*D. uroceras*, Lund.) Medium sized species, with eight molars, eight bands, and tail somewhat shorter than the body, and enveloped at the tip in a horny sheath.

D. septem-cinctus, Linn. (*D. hybridus*, Desm.) Smallest species, with seven molars, seven bands, and tail much shorter than the body. Inhabits Paraguay and Patagonia.

The Texas species is as large as the *D. novem-cinctus* of the above diagnoses, and has the tail, in the young, as long as the body, exclusive of the head; in the adult, as long as the body and half the head. It has eight free bands on the median line of the back, and nine on the sides. The tail has twelve free whorls, the tip plaited, but not enveloped in a sheath. The molars are eight on each side of each jaw. These characters are remarkably constant in a considerable number of specimens. There is, therefore, a good deal of uncertainty as to the species, which can only be settled by critical comparisons of a large amount of material from different localities. A single shell from Brazil has nine free bands on the back, and is otherwise quite different from the Texas armadillos.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	Whence and how obtained.	Nature of specimen.	Measurements.										Collected by—		
						Nose to eye.	Nose to ear.	Nose to occip.	Nose to tail.	Tail to end of vert.	Fore foot, length.	Hind foot, length.	Longest claw, front foot.	Longest claw, hind foot.	Height of ear.		Length of shell.	Width of shell.
2959	.....	○	Matamoras, Mexico	Lt. Couch.....	In alc..	1.12	1.93	1.96	6.00	3.60	.90	1.27	.38	.28	.90	.....	.....	Dr. Berlandier.
2960	.....	○	.....do.....	do.....	..do...	1.17	1.96	2.00	5.72	3.32	.82	1.26	.39	.30	.91	.....	.....	...do..
2961	.....	○	.....do.....	do.....	..do...	1.16	1.94	1.99	5.47	3.61	.82	1.29	.39	.30	.90	.....	.....	...do..
	1409	.....	.....do.....	do.....	Shell..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.50	15.50	...do..
	1410 ¹	.....	.....do.....	do.....	Skull..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....do.....
230	.....	.....	Lower Rio Grande.	Maj. W. H. Emory..	Skin ..	.....	4.30	.....	14.50	13.50	.....	.....	.....	.....	.....	10.25	12.50	J. H. Clark ...
	? 9195	.....	Brazil	T. Ewbank.....	Shell..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.00	15.00	do.....

¹ This skull measures 4.07 inches by 1.65.

ORDER V.

PACHYDERMATA.

Animals with from three to five toes, enveloped, or furnished with hoofs instead of claws; metacarpal and metatarsal bones short and distinct.

In the sketch of the orders of mammalia, on page 1 of this report, the diagnoses of the *Pachydermata* and *Ruminantia* were accidentally transposed, while the form was on the press, and the edition of the sheet printed off before the error was detected. The paragraphs should read:

VIII. *Pachydermata*, with more than two hoofs.

IX. *Ruminantia*, with two hoofs.

The error, however, is sufficiently palpable to be corrected at once. The diagnoses given of these, as well as of the other orders, are not presented as expressing their true or essential peculiarities, but merely as a convenient artificial analysis in which the characters assigned should be readily evident to the most casual observation. The *Ruminantia* have, in most cases, more than two hoofs, although there are but two in contact with the ground; above this level there may usually be seen two others of much smaller size. The American antelope, however, (*Antilocapra americana*) has in reality only two hoofs on each foot, the smaller ones being entirely wanting.

In the existence of only one living native species of *Pachydermata*, it will not be necessary to go into any minute account of the characters of the order and of its subdivisions. Nearly all the principal systematic writers differ in their views on this subject, some of them very widely. For my present purposes I have selected the arrangement of Giebel, as based upon a combination of all the living and fossil forms.

The *Multungula*, according to this author, or *Pachydermata*, in the most extensive sense of the word, are almost entirely of large size, embracing the most colossal of recent or fossil land animals. Their body is covered by a thickened skin, beset, more or less thickly, with bristly hairs. The number of toes varies from three to five, not always of the same size on the fore and hind feet. The muzzle is usually much developed, often extended into a snout of greater or less extent. The eyes are mostly very small. The neck is short and thick; the body stout, and supported on short, massive limbs, showing little indication of joints. The tail is short and slender, except in some fossil forms.

The teeth vary very much in number, shape, and structure. The incisors, canines, and molars are usually all present, the two former are never both absent at the same time.

The subdivision of this order, according to Giebel, are into the following families:

1. *Proboscidea*. Animals of colossal size, with the nose extended into a very long, prehensile snout, the upper incisors changed to enormous tusks; the head short and expanded above by large sinuses; neck very short; body short and thick; the limbs high, and without any angles or bends; the toes five, united to the hoofs.

It is in this family that we find the elephant of modern, and the mastodon of ancient times;

the former, however, occurring abundantly also as a fossil genus, in America as well as the Old World. The teeth differ much from those of the other families, in the constant absence of canines, and of lower incisors in any but very young animals.

2. *Genuina*. The members of this family are distinguished from the *Proboscidea* by the absence of the elongated, prehensile nose; and by the existence of small canines, instead of the enormous tusks, as well as of incisors in both jaws. The feet are three or four toed, with hoofs of unequal size, the limbs are short, the body, neck, and head more elongated. The body is usually full and rounded, the skin very thick and naked; the nose and ear flap much developed.

The living genera of this family are *Tapirus*, *Rhinoceros*, *Hippopotamus*, and, according to Giebel, *Hyraz*. The most important of the fossil are *Palaeotherium*, *Titanotherium*, *Anchitherium*, *Lophiodon*, *Anthracotherium*, &c., many of these with North American representatives.

3. *Suina*. Animals of comparatively small size. More compressed body, pointed head, large ears, blunt snout, slender, thin legs; hoofs arranged in pairs, and the skin covered with rather close bristly hairs.

The living genera of this family consist of *Sus*, *Dicotyles*, *Porcus* and *Phacochoerus*, the fossil chiefly of *Entelodon*, *Choeropotamus*, *Hyopotamus*, *Hyotherium*, *Adapis*, &c., nearly all with North American representatives in the bone beds of the Mauvaises Terres.

The genus *Sus* embracing the common hog is characterized by having four-toed feet, and in being without any gland on the back or fleshy lobes on the face. *Dicotyles*, with two species, one of them the common Peccary of Texas, has differently constituted canines, but three toes on the hind feet, a very rudimentary tail, and a peculiar gland on the back.

The genus *Porcus*, with the well known Babyroussa as its type, is chiefly characterized by its enormous canines, which curve upwards and outwards in a large semicircle.

The remaining genus, *Phacochoerus*, or wart hog, has the minimum number of incisor and molar teeth in the family, four-toed feet, four fleshy lobes on the face, large tusks, and a compressed and powerful body.

4. *Toxodontidae*. This family and the next, 5. *Anoplotheridae*, are composed entirely of extinct genera and species, some of which belong to our continent, the *Toxodontidae*, indeed, restricted to South America. It is in the *Anoplotheridae* that we find the transition from the *Pachydermata* to the *Ruminantia*.

It is much to be regretted that in his account of the fossil genera and species of the *Pachydermata*, Giebel should have entirely lost sight of the numerous species from North America, so ably and satisfactorily defined by Dr. Leidy.

DICOTYLES, Cuvier.

Dicotyles, CUVIER, "R. A. (1st ed.) I, 1817."

AUD. & BACH. N. Am. Quad. I, 1849, 233.

The genus *Dicotyles*, embracing the peccaries, has been sufficiently indicated in the preceding article for my present purposes. Time will not allow me to go into any extended description of its essential peculiarities of form and dentition.

DICOTYLES TORQUATUS, Cuv.

Texas or Collared Peccary; Mexican Hog.

Sus tajacu, LINN. Syst. Nat. I, 1766, 103, (in part.)*Sus tagassa*, ERXLEBEN, Syst. 1777, 185, (in part.)*Dicotyles torquatus*, F. CUVIER, Dict. des Sc. Nat. IX, 1817, 518.

DESM. Mamm. II, 1822, 392.

HARLAN, F. Am. 1825, 220.

WAGNER, Suppl. Schreber, IV, 1844, 306.

AUD. & BACH. N. Am. Quad. I, 1849, 235; pl. xxvi.

GIEBEL, Säugt. 1855, 234.

Sus torquatus, WAGNER, Schreber's Säugt. VI, 1835, 498; pl. cccxxv, cccxxv, A. (*Sus tagassu* on plates.)*Pecari a collier*, ST. HILAIRE ET CUV. Mamm. III, 1819; plate.

SP. CH —A white collar, more or less distinct, proceeding from the shoulders on each side of the neck.

The preceding brief diagnosis, taken from Wagner, is sufficient to distinguish the collared peccary from the only other known species, the *D. labiatus*, in which the lower jaw is white and there is no white collar. The materials before me are not sufficient to furnish any satisfactory description of the external form of the animal, consisting only of two hides, without head and feet. For full details on the structure and habits of the species, I would refer to the admirable article on the quadrupeds of North America, as quoted above.

The peccary has a much wider range in North America than is supposed by European systematic writers. It not only occurs through Mexico, but even as far north in the United States as the Red river of Arkansas, in latitude 34°. Its western limit is not well ascertained, though it is said by some to occur in California.

List of specimens.

Catalogue number.	Locality.	Whence obtained.	Nature of specimen.
61	Brazos river, Texas	J. M. Stanley.....	Hide.....
1747	Western Texas.....	Captain Pope.....	do.....

ORDER VI.

RUMINANTIA.

Feet bifid; metacarpus composed of a single bone, bifid at its lower extremity. Stomach compound.

In the preceding diagnosis from Wagner is contained, in very brief phrase, the most essential peculiarities of this extremely natural order of the Mammalia. The species vary comparatively little from one type of structure; the proportions of the body, as well as the size, differing, however, very much in different families. As a general rule, the neck is long and flexible, the body compressed, the tail sometimes very long, sometimes almost rudimentary. The legs are usually long and slender; the head armed with horns, which are either solid or hollow.

The best known characteristics of the ruminants are found in the structure and functions of the stomach. This is composed of four different compartments, each having a particular office. (The *Camelidae* have but three.) The food is hastily chewed and passed into the largest stomach, or paunch, and thence into the second; from this it is returned to the mouth and there completely masticated. It then passes back to the third stomach, and thence to the fourth, from which it goes into the intestines. The arrangements by which the food is directed first into one stomach and then into another, are very interesting and peculiar, but need not here be referred to.

The horns constitute another chief peculiarity of the ruminants. These are protuberances from the frontal bones, sometimes persistent and enclosed by a horny sheath, as in the sheep, ox, &c., or else they are solid and fall periodically, as in the deer.¹ These two different conditions give rise to the divisions of hollow and of solid horned ruminants.

The feet in the typical ruminants are bifid, the third and fourth fingers alone being developed the first finger is wanting entirely; the second and fourth are either very rudimentary, or else visible externally as accessory hoofs, above the level of the rest.

The ruminants may be arranged in three very natural groups; the first, with the horns solid, and usually deciduous, as the deer; the second, with permanent horns consisting of an exterior hollow horn encasing a process of the skull, as the sheep, goats, antelopes, oxen, &c.; the third, embracing the camels and llamas. These last have two incisors in the upper jaw, and the normal number of canines; no horns, and feet with two toes, without hoofs. No living representatives of the last named family exist in North America, although the majority of the species inhabit the South American continent. A fossil member of the group has, however, been characterized by Dr. Leidy,² from Kansas Territory.

¹In the giraffe, (*Camelopardalis*) the horns are mere knobs on the forehead, covered with skin, and not deciduous.

²*Camelops kansanus*. Leidy, Pr. A. N. S.

FAMILY. CERVIDAE.

Incisors $\frac{2}{2}$; canines $\frac{1-1}{0-0}$, or wanting; molars $\frac{6-6}{6-6}$. Horns solid, deciduous, (except in the giraffe,) not encased by horn; sometimes wanting. Feet bifid.

The members of this family agree with the following in the dentition and structure, and shape of the feet; they differ, however, in the character of the horns when present, (they are wanting in the musk deer.) There is not the same variety of shape as in the hollow-horned ruminants, although there are several very distinct forms of generic and sub-generic value.

The deer are very widely spread over the whole world, few regions being without one or more peculiar species. They appear able to withstand the rigor of an arctic winter, or the fiercest rays of the tropics. The new world possesses quite a notable proportion of the species; no less than nine of which are found in North America alone.

There are three principal divisions of this family; the musk deer, the true deer, and the giraffes. The musks differ from the true deer in being without horns, and any lachrymal sinus. The male has canine teeth usually projecting far beyond the mouth. Their size is very small, some of the species being by far the smallest known ruminants. The camelopard has short, solid horns, which are covered by the skin. The feet, too, though didactyle, are without the accessory hoofs of the deer.

Of the musk deer, there are no living representatives in America. Some of the fossil forms from the Mauvaises Terres of Nebraska approach very closely to them, however. There is nothing at all similar to the giraffe on this continent.

SUB-FAMILY CERVINAE.

Horns solid, always present in the males; sometimes in the females, not covered with skin. Feet bifer, with two small hoofs behind and above the large ones.

The preceding diagnosis is that of the genus *Cervus*, of older authors, although the great number of subdivisions, many of them quite different from each other, would seem to render it desirable to establish a sub-family to include them. The systematic arrangements of Sundevall, Gray, Pucheran, Wagner, and others, may be referred to for information respecting the variations in the different sections of the group; for my present purpose, however, I need merely mention those having a direct relation to the North American species. Of these there are three which may be briefly characterized as follows, (from Wagner:)

1. ALCE.—Horns very broadly palmated throughout, found only in the male; nose entirely covered with hair, except a small naked spot between the nostrils; very broad anteriorly.

The single species is the *Alce americanus*, or American moose.

2. RANGIFER.—Horns broadly palmated at the tip; found in both sexes. Nose entirely hairy; hoofs dilated; sub-oval.

Of this genus, embracing the reindeer, America possesses two species—the *R. caribou* and *groenlandicus*.

3. CERVUS.—Horns more or less rounded, or cylindrical, or conical; sometimes partly flattened, or subpalmated. Nose naked and moist. Sub-orbital sinuses distinct.

It is in this genus that our best known North American species fall: such as *Cervus canadensis*, *virginianus*, *leucurus*, *mexicanus*, *macrotis*, and *columbianus*. It has been generally customary to place the *Cervus canadensis* under another genus, *Elaphus*, but, for my present purposes, I prefer to retain all the deer with naked muzzles together.

ALCE, Ham. Smith.

Alce, HAM. SMITH, Griffith's Cuv. V, 1827, 303.

Alces, GRAY, Knowsley Menagerie, 1850, 56.

Muzzle very broad, produced, covered with hair, except a small moist naked spot in front of the nostrils. Neck short and thick; hair thick and brittle; throat rather maned in both sexes; hind legs have the tuft of hair rather above the middle of the metatarsus; the males have palmate horns. The nose cavity in the skull is very large, reaching behind to a line over the front of the grinders; the intermaxillaries are very long, but do not reach to the nasal. The nasals are very short.

In the preceding carefully prepared diagnosis, borrowed from Dr. Gray's elaborate article on the Ruminantia in "Knowsley's Menagerie," are embodied the chief peculiarities of the European elk and American moose.

ALCE AMERICANUS, Jardine.

Moose.

Cervus alces, HARLAN, F. Am. 1825, 229. (Description from European animal?)

GODMAN, Am. N. H. II, 279.

RICHARDSON, F. B. A. I, 1829, 232.

DEKAY, N. Y. Zool. I, 1842, 15; plate xxix, fig. 2.

AUD. & BACH. N. Am. Quad. II, 1851, 179; plate lxxvi.

Alces americanus, "JARDINE, Nat. Library, III, 1835, 125."¹

BAIRD, Rep. U. S. Pat. Office, Agricultural for 1851, (1852,) 112.

Alces machlis, OGILBY, Pr. Zool. Soc. Lond. IV, 1836, 135.

Alces malchis, GRAY, Pr. Zool. Soc. Lond. XVIII, 1850, 224, (in part.)—IB. Knowsley Menagerie, 1850, 67, (in part.)

Cervus orignal (DIERVILLE,) REICHENBACH, Vollst. Naturg. Säugt. III, Wiederkauer, 1845, 10; plate i, figs. 4, 5, 6.

Cervus lobatus, AGASSIZ, Pr. Bost. Soc. N. H. II, Dec. 1846, 188.

Alces muswa, RICHARDSON, Zoology of Herald, Fossil Mammals, II, 1852, 101; plate xx, xxii, xxiv. (Detailed account of osteology.)

L'Original, CUVIER & ST. HILAIRE, Hist. des Mammif. IV, 119; plate.

In the generic diagnosis I have given the chief characteristics of the American elk, as distinguished from the other American deer. It is not in my power to give any full description of the species, as the collections of the Smithsonian Institution embrace nothing but horns. This is of the less importance, however, as the description of external form and of habit by Audubon and Bachman leaves but little to be desired.

Authors disagree very much as to whether the moose of America is different or not from the Swedish elk. The prevailing opinion is, however, in favor of their identity.

Sir John Richardson, in the article on Fossil Mammals in Zoology of the Herald, calls our species *Alces muswa*. He gives a very elaborate account of the osteology of the species, and is quite inclined to believe, from actual comparison of skeletons, that the American and European species are distinct. Among other facts, he mentions that the breadth of the face at the most protuberant part of the maxillaries is less in the American than in the European animal.

As far as I can ascertain, a distinct and specific name was first applied to the moose by Sir Wm. Jardine, in 1835, in the name of *americanus*. I have not the work quoted above at hand, but borrow the reference from Reichenbach.

¹ I make this quotation from Reichenbach, not having the volume of Nat. Lib. at hand.

For the sake of illustrating the characters of the horns of the moose, I have given figures of antlers of an adult from Maine, and of a young male, probably in the second year, from New York. An extensive series of antlers from Sweden, in the Smithsonian collection, though somewhat different from the American, before me, yet furnish nothing of apparent specific value.

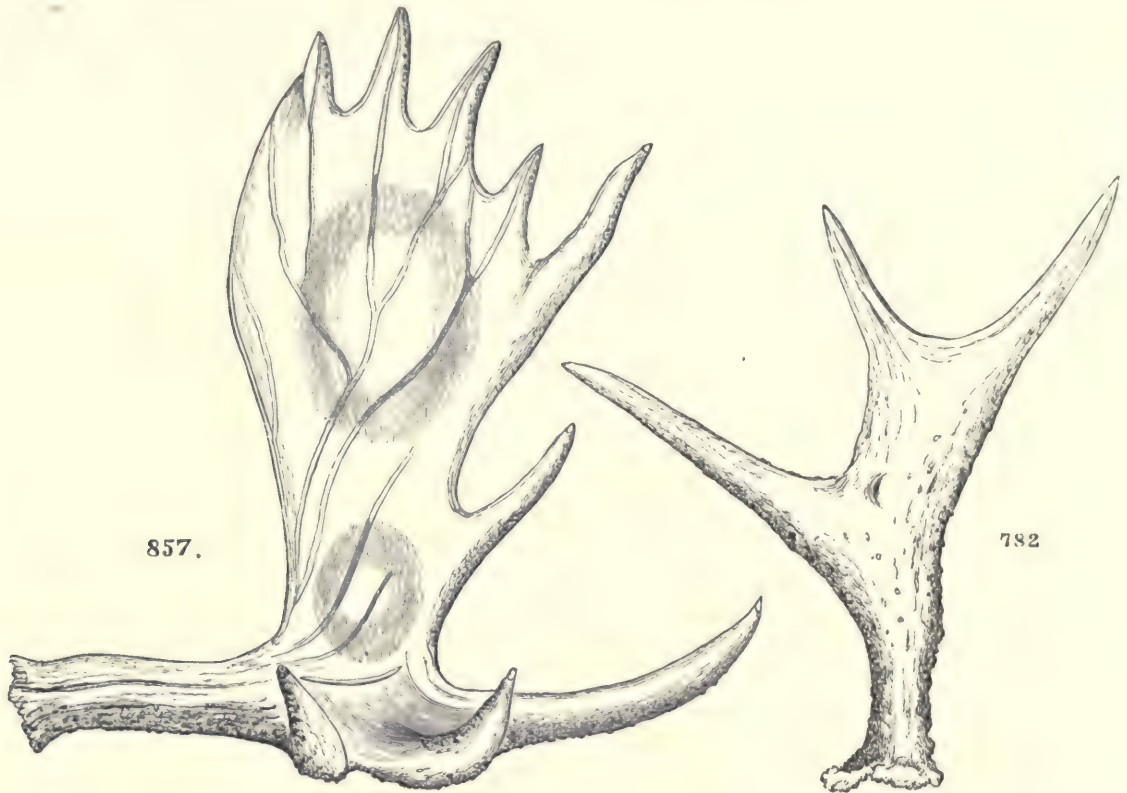


Fig. 1. *Alce americanus*, No. 857. Maine. Adult. Left horn seen from the front. Size, 5.09 inches to the inch of the figure.

Fig. 2. *Alce americanus*, No. 782. Hamilton county, N. Y. Young male of second year. Right horn from the front. Size, 4.10 inches to the inch.

The moose is the largest of the American deer, quite equalling a horse in bulk. Its range at the present day extends, on the west coast of America, from the shores of the Arctic ocean nearly to the Columbia river. Further east, the northern limit is about latitude 65, and thence through Canada to Maine, New Hampshire, Vermont, and the northern parts of New York. A few are still killed every year in Essex, Hamilton, and the adjacent counties of the last mentioned State, although, owing to the comparatively inaccessible nature of their resorts, their pursuit has become extremely difficult.

It is somewhat unfortunate that the European name of this animal, the elk, should be applied here to an entirely different deer. Much confusion has been produced in this way, and it becomes necessary to ascertain the nationality of an author before it is possible to know exactly what the word *elk* is intended to convey.

RANGIFER, Ham. Smith.

Rangifer, HAM. SMITH. Griffith's Cuvier, V, 1827, 304.

"*Tarandus*, (GRAY,) KAUP Europ. Thierwelt, 1829."

(GRAY,) Knowsley Menagerie, 1850.

Muzzle entirely covered with hair; the tear-bag small, covered with a pencil of hairs. The fur is brittle; in summer, short; in winter, longer, whiter; of the throat, longer. The hoofs are broad, depressed, and bent in at the tip. The external metatarsal gland is above the middle of the leg. Horns, in both sexes, elongate, subcylindric, with the basal branches and tip dilated and palmated; of the females, smaller. Skull, with rather large nose cavity; about half as long as the distance to the first grinder; the intermaxillary moderate, nearly reaching to the nasal; a small, very shallow, suborbital pit.

The preceding diagnosis, like that of *Alce*, is taken from Gray's "Knowsley Menagerie," and appears to embrace all the characteristics of the reindeer. The number of species is somewhat uncertain. We have two, in all probability, in North America, one peculiar to this continent, including Greenland, the other possibly identical with that of the Old World.

RANGIFER CARIBOU.

Woodland Caribou—Reindeer.

Cervus tarandus caribou, KERR, Linnæus, 1792, 297.

Rangifer caribou, AUD. & BACH., N. Am. Quad. III, 1853, 111; pl. cxxvi.

Cervus tarandus, HARLAN, F. Am. 1825, 232. (Desc. from Europ. Sp.?)

GODMAN, Am. N. H. II, 283.

Rangifer tarandus, DE KAY, N. Y. Zool. I, 1842, 121.

Cervus tarandus sylvestris, RICH. F. B. Am. I, 1829, 238.

Tarandus rangifer, OGILEY, Pr. Zool. Soc. Lond. IV, 1836, 134. (In part.)

J. E. GRAY, Pr. Zool. Soc. Lond. XVIII, 1850, 225. (In part.)

Cervus hastalis, AGASSIZ, Pr. Bost. Soc. N. H. II, 1846, 188.

Tarandus hastalis, BAIRD, Rep. U. S. Pat. Off. Rep. Agricultural for 1851, (1852,) 108.

COLOR.—Tips of hairs light dun gray, whiter on the neck than elsewhere; nose, ears, outer surface of legs and shoulders, brownish. Neck and throat dull white; a faint whitish patch on the sides of shoulders. Belly and tail white; outside of legs white; a band of white around all the legs adjoining the hoofs.

Length of an animal about two and a half years old: To root of tail, 72 inches; tail vertebræ, 4 inches; with hairs, 6.50; height of shoulder, 42 inches; from nose to ear, 14; height of ear behind, 5 inches.

I have condensed the description of the color of this species from Audubon and Bachman, not having at hand the means of furnishing an original account of the animal. The horns vary exceedingly, scarcely two, even of the same individual, being alike. In the accompanying figures I have given outlines of some of those in the Smithsonian collection; one an adult from Isle Royale, Lake Superior; the others, younger, from near Montreal.

The relationships of this species to the European reindeer are not well ascertained. By some zoologists it is supposed to be the same; by others different. The opinion is gaining ground that the barren ground reindeer is distinct, and as this species cuts it off from the arctic circle, it would seem most probable that it cannot be the same with the animal inhabiting the circumpolar region of the Old World.

The woodland caribou, as it is called by Dr. Richardson, is much larger than the barren ground reindeer found further north, but with smaller horns. According to this author, its northern limit is to the south of Hudson's bay, in a stripe of low primitive rocks about one hundred miles wide, and reaching as far west as Lake Superior. To the south it extends through Canada as far as New Brunswick and Maine, and possibly, in former times, to the northern parts of New Hampshire, Vermont, and New York. It is not known as an inhabitant of the Rocky Mountains.

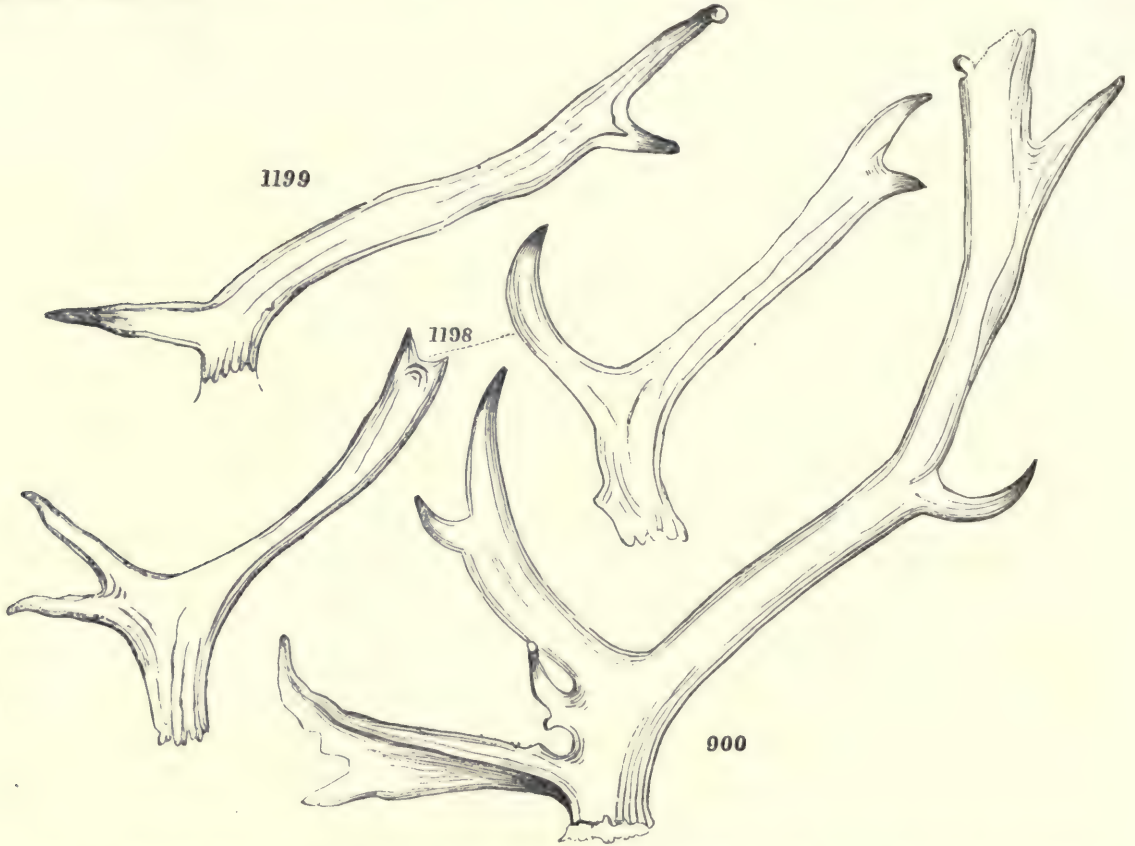


Fig. 3. *Rangifer caribou*, No. 900. Isle Royale, Lake Superior. Right horn from inside. Size, 6.30 inches to the inch.

Fig. 4. *Rangifer caribou*, No. 1198. Trois Rivières, Canada. Young, of probably second year. Right horn, view from inside. Size, 4 inches to the inch.

Fig. 5. Do. The left horn of the same animal viewed from the outside. Size, 3.14 inches to the inch.

Fig. 6. Do., No. 1199. Another horn from the same locality. Right side from inside. Size, 3.38 inches to the inch.

RANGIFER GROENLANDICUS.

Barren Ground Caribou.

Cervus tarandus groenlandicus, KERR, Linnæus, 1792, 297.

Cervus tarandus, var. *a. arctica*, RICH. F. B. Am. I, 1829, 241, (fig. of horns.)

KING. Narr. Capt. Back's Exped, II, 1836, 207.

Tarandus arcticus, BAIRD, in U. S. Pat. Off. Rep. Agricultural for 1851, (1852,) 105.

Cervus tarandus (*Tuktu*), RICH, Zoology of Herald, Fossil Mammals, I, 1852, 98; II, 1852, 15; pl. xxiii. (Desc. of skeleton and figure of skull and horns.)

Tuktu of the Esquimaux.

Of this species, as of the preceding, I have not the means of presenting any satisfactory diagnosis, although the opinion appears to be gradually gaining ground that it is distinct. The animal is much smaller than the woodland reindeer; the does not larger than a good-sized sheep. The bucks, when fat, weigh, after being cleaned, from 80 to 125 pounds. Notwithstanding this inferiority in size to the caribou of Maine and Canada, the horns are actually much longer, and more graceful in shape, as will be seen by the accompanying figures, taken from Greenland specimens:

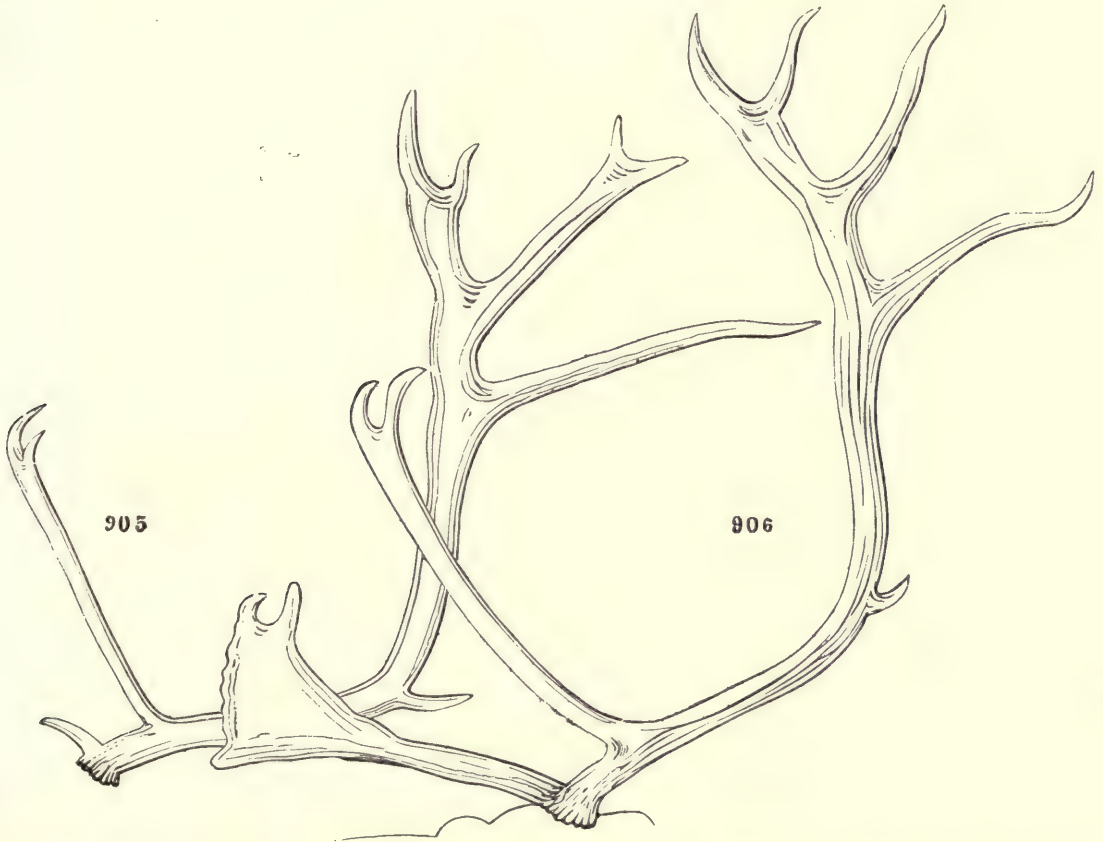


Fig. 7.—*Rangifer groenlandicus*, No. 906. North Greenland. Male. Right horn from inside, showing the palmated brow antler. The left horn is without it. Size, 7.08 inches to the inch.

Fig. 8.—The same species, No. 905, from the same locality, supposed to be a female. No palmated brow antler on either side. Right antler from inside. Size, 6.83 inches to the inch.

The most positive statement in reference to the difference of the barren ground and woodland reindeer is to be found in the work of Dr. King, quoted at the head of this article. In this, the author, after saying that his investigations and collections fully prove them distinct, regrets that the loss of the latter prevents him from substantiating his assertions. He, however, mentions that the barren ground species is peculiar not only in the form of its liver, but in not possessing a receptacle for bile.

The barren ground reindeer, as its name implies, is found in the barren district of arctic America, constituting the northeastern corner of the continent along the Polar Sea, bounded to the west by Great Slave, Athapasca, Wollaston, and Deer Lakes, and the Coppermine River, and to the south by Churchill River. It, however, ranges along the shores of the Arctic Ocean,

probably to the northwest coast ; to the north it reaches as far as Melville Island, or even still further. It is also found in Greenland, whence the skulls and horns in the Smithsonian collection were obtained.

It is a question, admitting this to be a distinct species, whether it should bear the name of *groenlandicus* or *arcticus*. Following the strict law of priority, however, I have retained the former, although objectionable on account of its local character.

CERVUS, Linn.

Nose tapering, ending in a naked moist muffle; tail usually well developed. Rather long false hoofs. Fawns, and sometimes the adults, spotted. Fur shorter and fulvous in summer, longer and grayer in winter. Skulls with a moderate nose cavity, and the intermaxillaries reaching to, or nearly to, the nasal bones.¹

The preceding diagnosis, taken from J. E. Gray, embraces the peculiarities of what he calls the deer of the temperate or warm regions, as distinguished from the arctic deer, as *Alce* and *Rangifer*, in which the nose is very broad at the end, and entirely covered with hair; the tail short, the horns palmated; the fawns not spotted, but uniformly colored like the adults; the skull with a large nose cavity, and the intermaxillaries not reaching the nasal.

The deer of the temperate regions again are divided by Dr. Gray as follows:

1. The *Elaphine* deer, with a distinct anterior basal snag to the horns; the muffle broad, and separated from the lip by a hairy band; the tuft of hair on the outside of the hind leg, above the middle of the metatarsus. Sub-genera *Cervus*, *Dama*.

2. *Rusine* deer, with a distinct anterior basal snag to the horns; the muffle very high, and not separated from the edge of the lip; the tuft of hair on the outside of the hind leg, above the middle of the metatarsus. Sub-genera *Rucervus*, *Panolia*, *Rusa*, *Axis*, *Hyelaphus*, *Cervulus*.

3. *Capreoline* deer, without any basal snag to the horn, the first branch being some distance above the burr; the sub-orbital crumen (and pit in the skull) generally small. Sub-genera *Capreolus*, *Cariacus*, *Blastocerus*, *Furcifer*, *Coassus*.

All the North American deer belong to the sub-genus *Cariacus* of the third group, with the exception of the elk, which is a typical *Cervus* in the first section.

As already remarked, I shall not attempt to divide the North American deer with naked muzzles, but throw them all in the same genus—*Cervus*. There are, however, three very distinct sections, which may be indicated as follows:

Section A. Size very large. Horns large, curving backwards, with the snags all directed forward, one of them immediately above the burr. Tail very short, the base surrounded by a pale patch. Naked muzzle, separated from the naked edge of the upper lip by hair, but connected with it by a narrow naked isthmus; no naked glandular space on the metatarsus. Hoofs broad and rounded. *Cervus canadensis*.

Section B. Muzzle broadly naked entirely to the edge of the upper lip. Tail long. A narrow short naked glandular space on the outer side of the metatarsus. Hoofs rather elongate. Horns smaller, curving forwards, with the first snag short, some distance from the base, directed upwards. All the other branches proceeding from the posterior edge of the main stem, and directed upwards. *Cervus virginianus*, *leucurus*, *mexicanus*.

Section C. Muzzle, hoofs, and tail in general, as in the preceding. Naked glandular space on the outside of the metatarsus longer. Horns with the lowest snag as in the preceding section, but smaller, sometimes wanting; main stem forking almost equally about the middle, each fork dividing again nearly equally at about its middle; in other words, the horns are doubly dichotomous. *Cervus macrotis*, *columbianus*.

¹ Gray,

l. Soc. Lond. 1850, 226.

CERVUS CANADENSIS, Erxleben.

American Elk.

Cervus elaphus canadensis, ERXLEBEN, Syst. An. 1777, 305.

BODDAERT, Elenchus Anim. 1784, 135.

Cervus canadensis, SCHREBER, Säugt. V, 1835 (!), 990; pl. ccxlv, (A).

DESMAREST, Mamm. II, 1822, 433.

HARLAN, F. Amer. 1825, 236.

MAX. VON WIED, Reise, II, 1839, 24, 84.

GRAY, Pr. Zool. Soc. Lond. 1850, XVIII, 1850, 226.

PUCHERAN, Archiv du Mus. VI, 1852, 386.

GIEBEL, Säugt. 1855, 348.

Cervus (Elaphus) canadensis, SMITH, Griff. Cuv. IV, 1827, 96; plate.—IB. V. 1827, 308.

Elaphus canadensis, DEKAY, N. Y. Zool. I, 1842, 118; pl. xxviii, fig. 2.

AUD. & BACH. N. Am. Quad. II, 1851, 84; pl. lxii.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 116.

Cervus strongyloceros, SCHREBER, Säugethiere, V, 1836 (!); pl. ccxlvii. F. G.¹

RICH. F. B. Am. I, 1829, 251.—IB. Zool. Beechey's Voyage, 1839, 10.

SUNDEVALL, K. Vetenskaps Akad. Handlingar, for 1844.—IB. Arch. Skand. Beit. II, 1850, 131.

Cervus (Elaphus) strongyloceros, WAGNER, Suppl. Schreb. IV, 1844, 348.

Cervus wapiti, BARTON, Am. Phil. Trans. VI. 1809, 70.

LEACH, in Journal de Physique, LXXXV, July 1817, 67.

Cervus major, ORD, Guthrie's Geog. (2d Am. ed.) II, 1815, 292, 306.—IB. Journal de Physique, LXXXVII, 1818, 150.

DESMAREST, Mamm. II, 1822, 432.

? *Cervus occidentalis*, HAM. SMITH, Griffith's Cuv. IV, 1827, 101, (fig. of horns in Brit. Mus. supposed to be from N. W. coast Am.)—IB. V, 1827, 303.

Stag, PENNANT, Hist. Quad. 1781, No. 45.—IB. Arctic Zool. I, 1784, 28. (Sp. in Leverian Mus.)

Elk, E. H. SMITH, Medical Repository, II, 1805, 157; plate. (Notice of habits, &c.)

Le Wapiti, ST. HIL. & CUV. Hist. Mammif. IV, 1819; plate.

SP. CH.—Hoofs short, broad, and rounded. Tail very short and depressed. Larmiers nearly as long as the eye; naked portion of the muzzle inferiorly only half as wide as the septum of the nostrils. No naked glandular space on the outer edge of the hind legs, but a short whitish patch of hairs near the upper part of the metatarsus.

In summer, general color light chestnut red; darkest on the neck and legs; throat and median ventral line dusky, almost black. Chin dusky, with a narrow patch of light yellowish on either side; a broad median yellowish patch under the head. Rump yellowish white, bordered by a dusky band which extends down the posterior face of the hind legs.

Winter colors more gray.

With nothing but skins before me, I find it impossible to present any very definite idea of the form and proportions of the American elk. In general shape there is not a great dissimilarity to the horse, the stature of which is fully equalled by some individuals.

The ears are rather short in proportion to the size of the animal; considerably less than in the Virginia deer. They are narrow and acuminate pointed; the anterior edge nearly straight; the posterior convex; both surfaces covered with rather long hairs; thinnest on the concavity.

¹ The article in the text, page 1074, refers to *C. virginianus*, mixed a little with *C. canadensis*. The horns described are unmistakably those of *C. virginianus*; those figures are *C. canadensis*. The date of 1836 is that on the title page of the copy consulted, (in Phil. Academy,) although the first portion of the volume was published from 1792 to 1800.

The naked muffle, fig. 9, differs from that of the Virginia deer in being longer, and in having the hairs on the side of the muzzle beneath the nostrils to come forward in front until there is only a narrow naked isthmus, less than half the width of the septum, connecting this with the narrow naked border to the upper lip at the extremity of the muzzle.

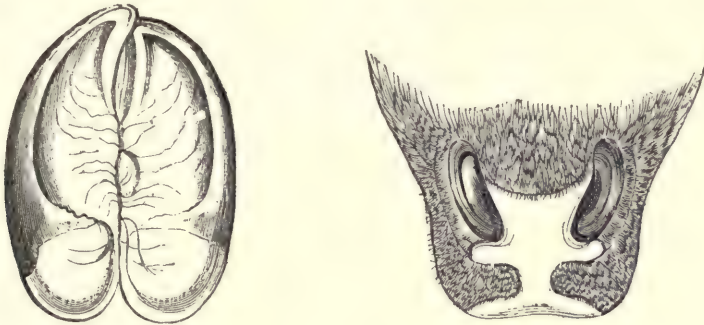


Fig. 9. *Cervus canadensis*. End of the nose as seen obliquely from above and in front. The figure not strictly accurate, having been taken from a dried and distorted skin.

Fig. 10. The same. Under view of left front hoof.

The larmiers are very conspicuous, their posterior extremity situated about half the diameter of the eye anterior to the orbit, with which they are connected by a naked skin; they are narrowly elliptical in outline, their longitudinal axis directed a little obliquely forwards and downwards, and of nearly the length of the orbit itself, certainly of the diameter of the eye. This secretes a yellowish waxy substance, usually found in considerable amount in the skin.

The upper border of the orbit is fringed with distinct eyelashes; on the lower lids are long scattered bristles. These bristles are also seen in the upper part of the muzzle, and scattered over the naked muffle.

The hoofs of the elk, fig. 10, are very different from those of the smaller deer; instead of being narrow and pointed, they are short, broad, and with the outer edge of the under surface much rounded; in fact, they bear a very close resemblance beneath to those of the buffalo. They are, however, about as long as deep behind, the lateral profile, therefore, somewhat of an isosceles right angle, while in the buffalo the posterior leg of the (obtuse-angled) triangle is about one and a half times the superior. In the hind foot of the elk the hoof is rather longer; in both feet, however, the basal outline is a broad ellipse, emarginate behind; the length but little greater than the width of both hoofs together. The anterior hoofs are rather the largest.

The tail of the elk is very short; in fact, almost rudimentary for so large an animal. In the largest skin before me it measures only six inches, the vertebral portion only four; in shape it is very broad, and much depressed, rather uniformly coated with hairs throughout.

There is a patch of whitish hairs on the outer edge of the hind leg, about one-third the length of the metatarsus from its upper edge. This is narrow and about two inches long; there is no naked space between these hairs, as in the Virginia deer. I have not observed the bushy bunch or patch of long hairs seen on the inside of the tarsal region in the Virginia deer, though it may possibly exist.

In the summer skin, the hair on the back and sides is short and compact; that on the neck

and shoulders is abruptly much longer and more bristly. The hairs immediately along the median line are considerably longer, but does not form a mane. The hairs along the throat on the under surface of the neck, extending to between the fore legs, is much longest and pendulous. The hairs in the whitish rump-patch are longer than elsewhere on the buttocks.

The prevailing color of an adult male before me is a reddish brown, darker on the head and neck, lighter and with more of a yellowish tint on the back and sides; there is a decided tinge of brownish chestnut about the head, and on the inferior line of the body from the chin almost as far as the hind legs; throughout this region it is much mixed with black, especially on the throat and under the belly. On the lower part and sides of the throat the bristly hairs are of a very dark brown, almost black, the tips only chestnut; the extent of this tip decreasing inferiorly; the ventral line of dusky is without chestnut tips. The upper surface of the muzzle is rather dusky; the sides of the upper jaw of a paler chestnut than elsewhere on the head; the anterior portion of the upper lip whitish. There is a very conspicuous mark on the chin in the presence of a brownish yellow patch on each side, (the two confluent on the anterior edge of the lip,) which run back three or four inches, then suddenly contracting and running out to a point, cease before reaching the angle of the mouth. These enclose between them a dark brown space. There is also another inferior median yellowish patch about opposite the middle of the lower jaw. There is a yellowish patch on the anterior and posterior edges of the ear, the concavity of which is yellowish, in strong contrast to the chestnut of its dorsal surface.

The edges of the orbits are dusky, but there is nothing of any light ring round the eye, except an occasional lightening of the ground color.

On the posterior part of the back, about a foot anterior to the tail, is a patch of pale yellowish brown, commencing as an angle and passing obliquely backward on each side, intersecting the posterior outline of the body about as far below the tail as it commenced anterior to it. This is well defined against the darker shade of the body, but is rendered still more conspicuous by a distinct broad dusky border beginning on either side, about opposite its middle, and passing backwards, then down the posterior face of the hind legs until it is lost in the general tint of the legs. All the legs are of a dusky chestnut brown, considerably darker than the ground color of the body.

I have no winter skins before me, and cannot describe their colors at this season, although, according to Audubon and Bachman, the hair is of a dark gray all over the body.

Summer specimens vary in having the ears much more dusky brown, with a narrow line of the same along the back of the neck. The legs are sometimes darker, sometimes as light as the back. The back is sometimes redder than as just described. In none have I ever seen anything of a pure or even tolerably pure white color in any part of body.

Length of No. 2013, from nose to root of tail, 8 feet 8 inches.

I have never had an opportunity of examining the skin of the European stag, the analogue of our species, but the differences are said to be very decided. Thus, according to Audubon and Bachman, the American animal is fully one foot higher at the shoulders; the upper parts and lower jaw yellowish brown, instead of blackish brown; the circle around the eye brown, instead of white, &c. J. E. Gray gives the diagnosis of the two species as follows:

CERVUS CANADENSIS. Hoofs broad, semi-circular; tail very short; withers covered with softer

hair in winter. Color, red brown; rump with a very large pale disk extending far above the base of the tail, and with a black streak on each side of it; male with hair elongated, black, with reddish tips.

CERVUS ELAPHUS.—Hoofs narrow, triangular; tail moderate; hair harsh. Color, brown; rump with a pale spot extending rather above the upper surface of the base of the tail.

The characteristics here given are very appreciable, and will readily serve to distinguish the two.

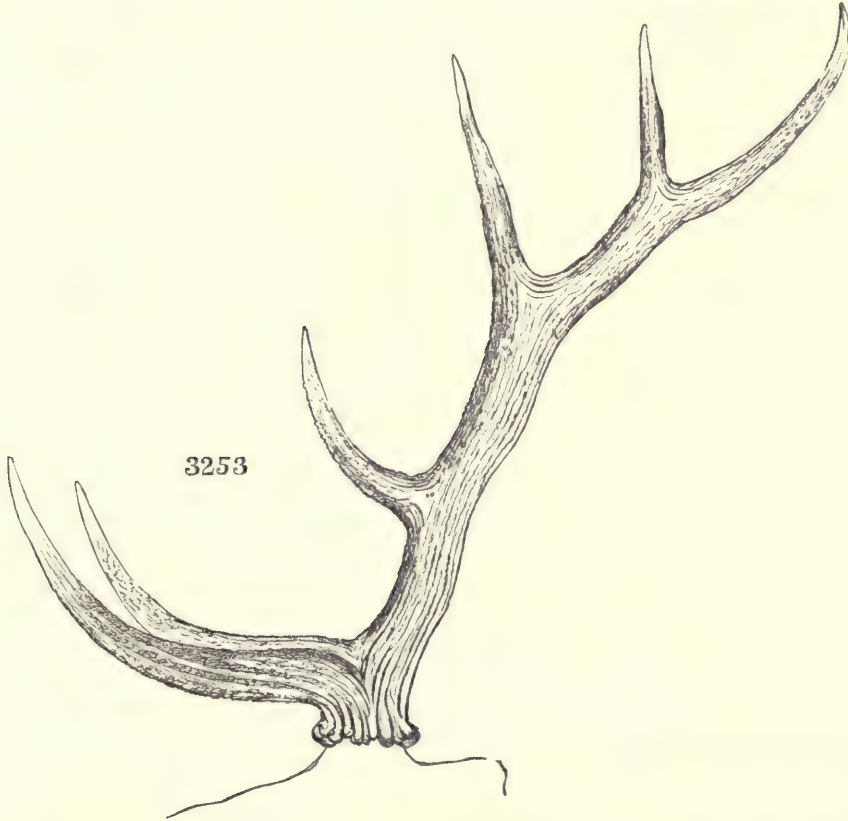


Fig. 11. *Cervus canadensis*, No. 3253. California. Right horn from inside. Size, 9.90 inches to the inch.

The horns of the elk, (see fig. 11,) in their perfect condition, are nearly cylindrical, or rather slightly oval, in transverse section, the compression antero-posteriorly for the basal half, after which they flatten out a little more. The surfaces are covered very thickly with warts or pustular elevations, arranged in lines separated by longitudinal grooves; the points of the antlers are generally worn smooth and sharp, these bone white; the rest of the horn in its perfect condition is almost a walnut brown.

In the elk all the snags spring from the anterior face of the horn. Two long ones start from the very base of the horn, one immediately above the other, the lower proceeding parallel with the axis of the head, the upper more divergent laterally, so that the points are about eight inches apart. At the ends of the first and second thirds of the main stem, from the base spring a third and fourth snag, up to which point the posterior outline is tolerably straight;

half way between the tip of the sixth snag arises the fifth, the two forming a fork directed upwards, the posterior branch of the sixth snag usually a little longest. There are thus in the normal horn four points, the two lower much longest, (about one-third the curve of the main stem.) The third and fourth snags are smaller and nearly equal, the fifth and sixth still smaller. The two lower snags curve rapidly upwards near their tip; the third curves more gently; the others are nearly straight.

Sometimes the horns are much more cylindrical throughout, having the proportions of the Virginia deer. At others the palmation at the end is much greater; this is especially the case in No. , from the Yellowstone, where the flattening is more like that of the moose. This specimen has nine points, the largest number I have seen; seven is not very unusual, the seventh being either a bifurcation of one of the terminal snags, or else springing from the forks of two of them.

The two basal snags are generally very regular and symmetrical. In one specimen the upper one on one side is bent abruptly downward.

The young buck in its first horns has these a mere club-shaped spike, truncate at the end, curved as in the adult, and without branches; about eighteen inches long. I am not able, with the materials before me, to trace them through their progressive stages of development. One horn, possibly of the second year, is bifurcated at the tip; in a young male of five points it is the terminal fork that is wanting. In one instance, an elk kept in a park always reproduced, for several years in succession, a mere spike or club on one side, the other horn attaining its normal development. This was owing to an injury to the growing horn of that side in youth.

The size of the horns of the elk varies considerably. The largest I have seen measures $11\frac{1}{2}$ inches in circumference above the burr, and $7\frac{1}{2}$ to 8 above the two basal snags. The longest horn before me measures 54 inches along the curve of the posterior edge; the chord of the arc, 43; the extreme divergence of the tips of opposite horns, 30 to 36 inches. The heaviest pair of horns weighs, with the skull, $38\frac{1}{2}$ lbs. (the lower jaw wanting.) I am assured, however, that much larger horns exist; some, indeed, of such size, that when inverted on their tips, a tall man can walk beneath the skull without touching.

Cuvier, in *Ossemens Fossiles*, (2d ed. Atlas II, pl. clxiv,) figures in part the succession of form in the American elk, from youth to maturity. In figs. 18, 19, 20, are represented horns of the elk with but one basal snag, instead of the two usually seen; these, however, are horizontal, and were grown in confinement. In plate clxvi, fig. 35, is shown a horn sent to the museum from New York, by Milbert, and said to have been brought from the northwest coast by Lewis and Clark. The form of this is entirely different from the horn of an elk; having, it is true, the snags anterior, but there is only one at the base, which is turned up so as to be parallel with the main stem. As Cuvier remarks, this is almost exactly the horn of *Cervus hippelaphus*, an Old World species, (from Java.) I have no doubt that the locality and collectors assigned are entirely erroneous, as Lewis and Clark make no mention of such horns, and nothing of the kind is to be seen in the numerous collections of horns from Lewis and Clark's localities, in the Smithsonian Institution and elsewhere. Milbert, as is well known, made many grievous mistakes in the localities of his American collections, such as assigning to New York

species of *Ameiva* and other reptilia, known to be exclusively South American; and it is more than probable that the present is another of his errors.

The elk is the most widely distributed of any American deer, reaching from the Atlantic to the Pacific, and ranging through many degrees of latitude—according to Richardson, as far north as the 57th parallel. At the present day the only well ascertained eastern localities are the Allegheny regions of Pennsylvania and Virginia; the fact of its occurrence in New York being very uncertain. It is not met with until we reach Minnesota, (or perhaps northern Wisconsin); to the westward of this it becomes abundant, and appears most numerous on the upper Missouri and Yellowstone.

A very complete account of the habits of this species will be found in the article of Audubon and Bachman.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	
487	1638	♂	Pennsylvania.....	.....	Prof. S. S. Haldeman.....	.....	Antlers .....	.....	.....	.....	.....	.....
488	1639	♂	Clarke county, Va	Oct., 1854.....	Col. Jos. Tuley .....	.....	Skin in alc. ....	.....	.....	.....	.....	.....
2013	2847	♂	do.....	Jan., 1855.....	do.....	.....	Skin .....	.....	.....	.....	.....	.....
2020	2854	♂	White Earth river, Neb.	Sep. 12, 1856	Lt. G. K. Warren.....	.....	do .....	.....	104 .....	.....	.....	Dr. F. V. Hayden.
2018	2852	♂	Little Missouri	Sep. 15, 1856	do.....	.....	do .....	.....	.....	.....	.....	.....do.....
2019	2853	♂	Fort Berthold	Sep. 16, 1856	do.....	.....	do .....	.....	.....	.....	.....	.....do.....
2015	2849	♂	White Earth river.....	Sep. 8, 1856	do.....	.....	do .....	.....	.....	.....	.....	.....do.....
1881	2579	♂	Yellowstone	August.....	do.....	.....	do .....	.....	.....	.....	.....	.....do.....
1880	2578	♂	Republican Fork	Oct. 4, 1856	Lt. F. T. Bryan	369	do	26	156 ¹	5.00	7.50	W. S. Wood.....
1882	2580	♂	Medicine Bow river.....	Aug. 22, 1856	do.....	296	do	22	117 ¹	7.00	8.50	do.....
1882	3253	♂	do.....	Aug. 23, 1856	do.....	327	do	14 ¹	71 ¹	3.50	6.00	do.....
			San Francisco, Cal.....	.....	Lt. W. P. Trowbridge.....	.....	Antlers .....	.....	.....	.....	.....	.....

¹ I give these measurements as being on the labels, but there is evidently an error of some kind in the excessive length.

CERVUS VIRGINIANUS, Boddaert.

Virginia Deer.

Cervus virginianus, BODDAERT, *Elenchus Animalium*, I, 1784, 136.

ZIMMERMANN, *Pennant's Arktische Zoologie*, 1787, 31.

GMELIN, *Syst. Nat.* I, 1788, 179.

KERR's *Linnæus*, 1792, 299.

SCHREBER, *Säugt.* V, 1836.¹(!); tab. ccxlvii, not of text.

SHAW, *Gen. Zool.* II, 1801, 284.

DESMAREST, *Mammalogie*, II, 1822, 442.

?SAY, in *Narr. Long's Exped.* I. 1823, 103. (var.)

HARLAN, *F. Am.* 1825, 238.

GODMAN, *Am. N. H.* II, 306.

DOUGHTY's *Cab. N. H. I.* 1830, 3; pl. i. ♂, ♀, o.

DEKAY, *N. Y. Zool.* I, 1842, 113; pl. xxviii. f. 1.

WAGNER, *Suppl. Schreb.* IV, 1844, 373.

AUD. & BACH, *N. Am. Quad.* II, 1851, 220; pl. lxxxix, cxxxvi.

PUCHERAN, *Mon. du Cerf, Ann. du Mus.* VI, 1852, 305.

Cervus (Mazama) virginianus, HAM. SMITH, *Griffith's Cuv.* IV, 1278, 127, V, 315.

SUNDEVALL, *K. Sv. Ak. Vet. Handl. for 1844.—Ib. Archiv Skand. Beit.* II, 1850, 134.

¹ See note p. 644

Cervus (Cariacus) virginianus, J. E. GRAY, Knowsley Menagerie, 1850, 66; tab. xlv. (winter sp. from Texas and *C. mexicanus*?)—*IB.* Pr. Zool. Soc. Lond. XVIII, 1850, 238.

Cervus dama americana, ERXLEBEN, Syst. An. 1777, 312.

Cervus strongyloceros, AUTENRIETH, in Schreber Saugt. V, 1836. (!) 1074. Text, not the figure.

Virginian deer, PENNANT, Synopsis, 1771, 51.—*IB.* Hist. Quad. 1781, No. 46.—*IB.* Arctic Zoology, I, 1784, 28.

Le Cerf de Virginie, ST. HILAIRE & CUV. Hist. des Mammif. IV, 1819, plate, ♂, ♀.

Cerf a dagues, *IB.* (Spike buck.)

Cerf de la Louisiane, *IB.* (female.)

SP. CH.—Horns with the branches all from the posterior edge. Ears scarcely more than half the length of the tail. Gland of hind leg not one-eighth the distance between the articulating surfaces of the bone. Tail depressed, hairy beneath; dark brown near the tip, but encircled by white on sides and tip; entirely white beneath. Winter coat, pale grayish chestnut, faintly annulated; summer, bright uniform rufous. Chin with a transverse band of black; and behind this one of the color of the sides of the head.

Young male, killed September 10, 1855. Not quite three months old. Elizabethtown, New York.

Form very slender, delicate and graceful. Head, acutely pointed; the outline of the muzzle slightly concave. Anterior canthus of the eye about midway between the end of nose and the back of head, or posterior base of the ear. The eye itself is full and large, with a fringe of eyelashes on the posterior half of the upper lid, and longer scattering bristles above these and on the lower lid. The larmier is quite deep, elongated obliquely; its deepest part about half an inch in front of the eye; it is naked except around the margin, as also is the space between it and the eye. The naked muffle is broader than high, and extends back on the upper surface of the



Fig. 12. *Cervus virginianus*: End of the muzzle, as seen obliquely from above and in front. The figure is to be considered simply as a diagram, having been taken from a much distorted skin (not from the animal here described); it is only intended to show the general outline of the naked portion.

muzzle for nearly its height at the end; its postero-superior edge is straight; its infero-lateral ones are likewise straight, but inclined to each other, so that if produced they would unite below and form an equilateral triangle, with a line connecting their upper ends. The nostrils are crescentic; the convexity inferior; their direction parallel with the outline of the muzzle; the anterior half of the crescent is in the naked muffle, the posterior covered with hair far over the inside; anteriorly they are distant about seven lines, or nearly the width of the lower part of the muffle. The nostrils, however, have almost everywhere short, sparse hairs. The surface of the naked muffle is divided by narrow furrows into subhexagonal spaces.

The lips are fleshy; the edges and inner margins dark colored, covered with short, angular, flat, tooth-shaped, cartilaginous processes.

¹ I cannot find the date of the original edition of this portion of Schreber's work; it is probably about 1792. The title page of the volume as completed gives 1836.

The ears are long and broad ; the antero-superior edge nearly straight ; the posterior very convex on its inferior half, (the upper part nearly straight.) The greatest width of the ear, in its unflattened state, is about half the length of the anterior edge. The length from the notch is equal to the distance from the posterior part of the orbit to the muzzle ; the total length of the cartilage is as long as the lower jaw, and about two-thirds the length of the head. The ear itself is very simple ; the lower half of the anterior edge is inflexed. The antitragus is a short, low ridge, running parallel with the lower edge of the ear ; above this is a second low ridge, nearly parallel with it and longer ; but these ridges are covered with long whitish hairs. Above the last mentioned ridge is a long shallow wrinkle, the salient portion in the concavity of the ear. The inside of the ear (its external surface) is naked, with scattered hairs, except on the two cartilaginous ridges and the margins ; the internal surface or convexity is covered with close short hairs, except near the tip, which is almost naked.

The hoofs (see the accompanying plate) are narrow and long ; the lower side scarcely more than half as broad as the internal face, and its external border very gently convex ; its length about three and a half times the breadth. In the hind foot, the disproportion is not quite so great as in the fore foot. On the outside of the hind leg, and about halfway between the heel and the tip of the hoofs, is a longitudinal, narrow, naked space, about as long as the bone is wide at the same place, (about 8 lines.) This is margined all round by a depressed tuft of long white hairs. On the inside of each hind leg, again, opposite the insertion of the tendo Achillis, is a large full bunch or tuft of long stiff hairs, the object of which may be to keep the legs from knocking together in running.

The tail is long and bushy, the hairs longest laterally, which gives it a greatly depressed appearance. The vertebræ are a little longer than the skull.

In this male, the four nipples are distinctly visible in their place, as in the female.

The prevailing color of the back and sides (except on the spots) is a light chestnut red ; the buttocks, the lower part of the sides, side of the head, the outside of the limbs, and the sides and anterior surface of the neck to between the forelegs, of a pale cinnamon. The under parts, from the belly to the tip of the tail, including the inside of the fore arm and thighs, are pure white to the roots. The inferior half of the inner surface of the limbs is a dirty whitish cinnamon. As stated, the under surface of the tail is white, as also are the extreme edges. The hairs on the upper surface are dark brown or sooty at the base, with rusty tips. The white spots on the back and sides are quite symmetrically arranged. There is a row extending from the head to the tail, on each side of the spine, the two parallel, and separated by about the width of the neck. On the neck these spots are confluent with a continuous white line. There is a row of larger spots on each side, separating the red from the cinnamon portion, and between these are twenty-five or thirty irregularly placed spots, besides a cluster on the outside of the shoulder and thighs.

The top of the head is like the back. The muzzle is of a fine pepper and salt color, or with a tinge of cinnamon. The lower part of the head is dull white, as is a spot above the eye. There is a black band encircling the end of the muzzle, crossing over the posterior portion of the nostrils, broadest on the upper jaw, narrower below. The space between this bar and the end of the snout is of a purer white than elsewhere on the head. The skin on the convex surface of the

ear is a light sooty brown, as is the lower portion and tip of the opposite side. The hairs themselves are dull whitish near the base, pale cinnamon elsewhere.

Measurements.

	Inches.
Nose, to occiput.....	7.50
to eye.....	4.00
to ear.....	7.00
to root of tail.....	31.00
to end of outstretched hind legs.....	53.00
Length of orbit.....	.93
Tail, from root to end of vertebræ.....	8.00
from root to end of hairs.....	10.00
Ears, height posteriorly.....	5.75
height anteriorly.....	4.50
height internally above skull.....	4.50
height above notch.....	4.50
width.....	3.08
total length of cartilage.....	5.66
Arm, between claws across shoulder.....	50.00
length of fore arm.....	7.00
from elbow to end of claws.....	16.50
metacarpus.....	6.50
fore foot, from end of metacarpus.....	4.00
longest claw.....	
Leg, from knee joint to end of claws.....	21.00
tibia.....	10.00
hind foot, from end of tibia to foot.....	7.50
hind foot.....	4.00
Commissure of mouth.....	2.08
Width of nostril.....	1.00
Circumference at shoulder.....	19.00
at middle of body.....	25.00

In the preceding detailed description of the Virginia deer I have presented the principal features of form as seen at all ages. As characteristic of the adult, I may add, that in summer the hair above and on the sides is of a uniform bright bay or yellowish red, without annulation of any kind, and only a little paler towards the roots. The under parts are mostly white. The hair is also very thin and close pressed.

The winter coat varies considerably, however. The hairs are much longer and denser. The prevailing tint all over, except where otherwise indicated, is a light yellowish red, with a strong tinge of gray, and finely mottled or variegated with brown. The hairs, taken singly, are of a light ash at the base, then brown, (darkest at tip,) with a subterminal annulus of light grayish chestnut or grayish red. The space between the fore legs, and extending in a point a little posterior to this is like the back but with no distinct annuli. The whole under

parts, from near the fore legs, including the inside of the thighs and the buttocks, and the under surface and sides of the tail, are white. There is also a white and abruptly truncated patch on the throat opposite to the space between the rami of the jaws, of which color are also the region around the eyes, (except the dusky eyelids,) the end of the chin, the sides of the muffle, and the posterior portion of the ears near the base. There is a dusky ring passing over and around the posterior margin of the naked muffle and encircling the lower jaw just behind the white tip of the chin; on the upper jaw, again, there is a lighter space just behind the dusky one. The tail, as already stated, is white beneath, and on the sides, this color showing conspicuously from above; the upper surface is reddish at the basal half; the rest of it (coming to a point in the white) is of a nearly pure sooty brown in some specimens; in others, this is overlaid with rusty so as to be obscured. In all cases, however, the white margins the dusky of the tail all round as seen from above. There is generally a dusky shade towards the tips of the ears. The tail is very full and bushy; broad and depressed; well covered everywhere with hair.

Sometimes, in old males, there is a very strong tinge of dark chestnut on the top of the head and on the lower portion of its sides, the muzzle posterior to the light patch behind the nostrils being quite dark and mottled with whitish.

A single head, (1489 ♀,) marked "Black Tail deer," the precise locality of which is unknown, but either from Western Texas or the Upper Missouri, in general character of length of ear resembles the *Cervus virginianus*. The hair of the muzzle comes down over the naked muffle more in a point, however, instead of passing nearly transversely across. The ears are densely coated with hair, and nearly black on the terminal half of the convexity. The chestnut of the cheeks is continuous across the chin posterior to the white terminal patch. The white patch between the rami of the lower jaw is considerably more restricted than in *C. virginianus*.

This deer is very different in many respects from the western species, *C. macrotis* and *columbianus*. For the characters in which the distinctions consist, I would refer to the articles on these species. A peculiar feature is seen in the very short and broad gland on the outer edge of the hind leg which is about as long as the bone is wide, and is encircled by white hairs. For the differences from the supposed *C. leucurus*, see the next article.

The peculiarities of the horns of this deer will be best understood by reference to the accompanying figure (13).

From this it will be seen that the horn bends first backwards and outwards, then forwards and outwards; and that beyond the sub-basal snag, which starts from the inner face of the antler and is directed upwards, all the branches spring from the posterior part of the main stem. The figure represents an average horn; more usually there are but two posterior branches. Sometimes the basal snag is much longer than in the figure; the curvature of the horn, too, varies a good deal. Sometimes a perfectly adult, full grown male will have but a single slender spike, thus resembling the buck of the second year.

The Virginia deer is the best known, and probably the most abundant of the American deer. According to Audubon and Bachman, it is not found north of Maine, from which limit it is spread over the entire area of the United States east of the Missouri river. Although less common than formerly, it is met with in large numbers in the mountainous portions of New York, Pennsylvania, Maryland, Virginia, and States further south, as well as on the seacoast region.

On the Upper Missouri, and west, it is replaced by an allied species, and it probably does not extend to the western borders of Texas. In Mexico and Sonora it is replaced by the *Cervus mexicanus*.

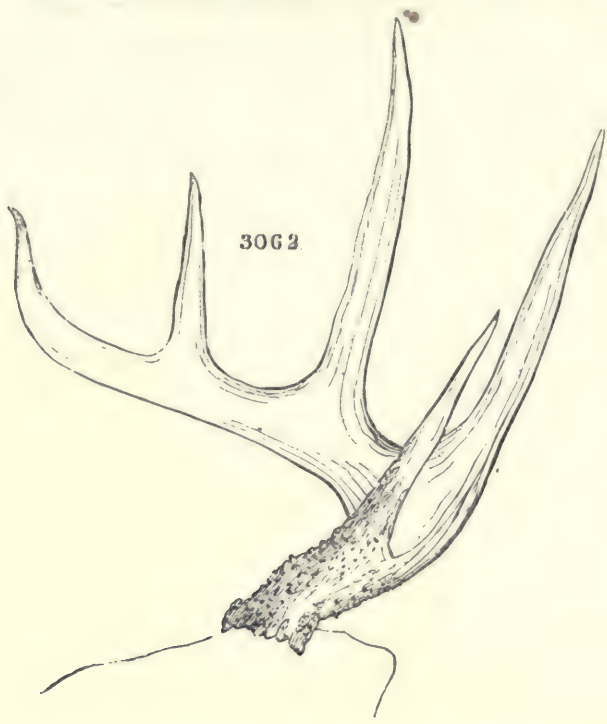


Fig. 13. *Cervus virginianus*, No. 3062. Essex county, New York. Right horn from inside. Size, 4.16 inches to the inch.

It is a well ascertained fact that the more northern specimens of this deer are appreciably larger than those found further south, and that the deer of the southern seacoast and its islands are smaller than those of the uplands and mountains of the same latitude. This fact is well established by the comparison of specimens in the Smithsonian collection, from New York and from St. Simon's island.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Measurements.		
							Nose to occip.	Nose to tail.	Tail to end of hairs.
2357	3144	♀	St. Simon's island, Ga.	Aug. 5, 1856	Dr. S. W. Wilson	Skin	10.00	54.00	9.00
2256	3119	♀	Rowleysburg, Va.	Feb'ry, 1857	A. Brakley	do.	13.00	59.00	
1555	2384	♀	do.	Feb'ry, 1856	do.	do.			
852	1908	♀	Saranac lake, N. Y.	Sept. 7, 1855	S. F. Baird	do.			
853	1909	♂	do.	do.	do.	do.			

CERVUS LEUCURUS, Douglas.

White-tailed Deer.

Cervus leucurus, DOUGLAS, Zool. Jour. IV, Jan. 1829, 330.

RICHARDSON, F. Bor. Am. I, 1829, 258.

WAGNER, Suppl. Schreb. IV, 1844, 375.—Ib. V, 1855, 372.

PUCHERAN, Mon. du Cerf, Archiv du Mus. VI, 1852, 322.

AUD. & BACH. N. Am. Quad. III, 1853, 77; plate cxviii.

? *Cervus (Mazama) leucurus*, SUNDEVALL, K. Sv. Vet. Ak. Handl. 1844, (from living specimen in Ménagerie du Museum, Paris.)—Ib. in Hornschuch, Archiv Skand. Beiträge zur Naturgeschichte II. 1850, 135.

? *Cervus macrourus*, RAFINESQUE, Am. Monthly Mag. I, 1817, 436.

HAM. SMITH, Griffith's Cuvier, IV, 1827, 134—V, 1827, 316, (from Kansas river.)

Long-tailed red deer, LEWIS & CLARK.

SP. CH.—Horns and gland of the hind legs as in *C. virginianus*; tail, appreciably longer; hoofs, long and narrow; fur, compact. General color above, in autumn, yellowish gray, clouded and waved, but not lined with dusky. Chin, entirely white, with only a small dusky spot on the edge of the lip. Ears gray, with a basal white spot behind. Anal region and under surface of the tail, but not the buttocks, white. Tail, reddish above, without exhibiting any dusky.

(1885.) This animal has the general appearance of the *Cervus virginianus*, in many respects, though differing appreciably from the specimens with which I have compared it. The ear is rather narrow, but long, measuring 6.20 along its anterior edge; its greatest width 4.50. They are thinner and more acuminate at the tip than in *C. virginianus*. Both surfaces are well covered with hair: that on the concavity being long and loose, that on the convexity short, compact, and close.

There is nothing in the dried and distorted skins to indicate any peculiarities in the naked muffle.

The feet are very delicate and slender, appreciably more so than in *C. virginianus*. The hoofs, too, are long, narrow, and acute. That surface of the anterior one which is applied to the ground is three times as long as wide (2.20+.65,) the false hoofs long. The distance from the tip of the fore hoof to the posterior extremity amounts to 3.15; in a skin of *virginianus* of the same size, 2.60. The entire length of the posterior hoof is 3.20 inches, its width .65, or almost exactly that of the anterior. The outer border of the basal portion is nearly straight, instead of much curved as in *C. virginianus*. The gland on the outer edge of the hind leg is situated a little below the middle of the metatarsus. It is short, the naked portion measuring only about an inch.

The tail is moderately long and bushy, of uniform width from the base to the pointed tip, rather depressed; the hairs of equal length on the sides from the base to the tip. Its length does not exceed that of the head.

The prevailing color of this species in the fall of the year, and probably in the winter, is a yellowish gray, clouded and waved with black caused by the dusky tips to the hairs. This color is purest and grayest on the neck (nearly the same all round) and head, the long hairs on the top of the head only being more fulvous. The chin and throat are dull white, the former without any band, but merely a dusky spot on the side; there is also a suffusion of dusky on the sides and on the top of the upper jaw just behind the muffle, but no continuous ring. The

ears are uniformly brownish gray, lined and pointed somewhat with dusky, the concavity and the basal portion behind being white. The under part of the neck, from the white patch beneath the head to between the fore legs, is of the same brownish gray, with a slight sooty tinge posteriorly; the rest of the under parts to the tail are opaque white. The under part of the tail and the region around the anus are also white, but apparently less conspicuously so than in *C. virginianus*. The upper surface of the tail is of a uniform reddish brown, brighter than elsewhere on the body. The legs are of a nearly uniform pale brownish yellow, rather lighter internally.

In another specimen, (1886,) killed about the same time, there is rather more fulvous in the yellowish brown and gray tints, approximating the colors somewhat to those of *C. columbianus*. Specimens from the upper Missouri agree in most respects, but are still grayer; indeed, the color of the back is exactly that of a *Cervus macrotis*, killed at the same time.

There is no old animal of this species before me in full summer dress. A female from the Republican Fork, possibly a true *C. virginianus*, is of rather a lighter red than in the eastern specimens. The fawns are spotted much as those of *C. virginianus*. In no one of the many specimens before me is there anything of the dusky ring below the chin, the nearest approach being in the small dusky spot on each side.

In the preceding description I have proceeded on the supposition that the animals described are specifically distinct from the *C. virginianus*. In placing a series side by side of each, there are certainly very appreciable differences, some of which have been already referred to. The size is about the same. The fur of the Rocky Mountain animal is much closer and more compact, and appears somewhat finer. The peculiar waves of dusky I have not seen in the *C. virginianus*. The colors are much paler throughout, more like those of *C. macrotis*. The legs appear to be more slender; the hoofs narrower and longer. The nearly immaculate chin is a strong feature, this region being without the black ring bordered behind by reddish. The ears are more uniformly gray. The horns, tail, and gland of the metatarsus are very similar in both, and exhibit nothing distinctive.

The horns of this animal resemble very closely those of *C. virginianus* from the eastern portion of the United States. There is a basal snag starting from the inner face of the horn, about three inches from the base. All the snags above this spring from the posterior edge of the horn, those of opposite sides corresponding to each other in the two horns, sometimes nearly parallel, sometimes convergent. There are usually three of these posterior snags, equidistant and diminishing in length successively, the terminal one about as long as the end of the main stem. This bends abruptly a little before it reaches the middle; the two branches of the curve nearly straight.

The horns are more inclined to have three posterior snags than in *C. virginianus*. In extreme age the horn becomes more compressed and the warts towards the base very prominent. As a general rule there is a much greater diversity of form here than in the *C. virginianus*, as will be seen from the accompanying wood-cuts, which are far from exhausting all the varieties in the Smithsonian collection. One of these, figure 17, is from Puget's Sound, and belongs to the typical *C. leucurus*. It is in some respects quite different from the others, and may be distinct.

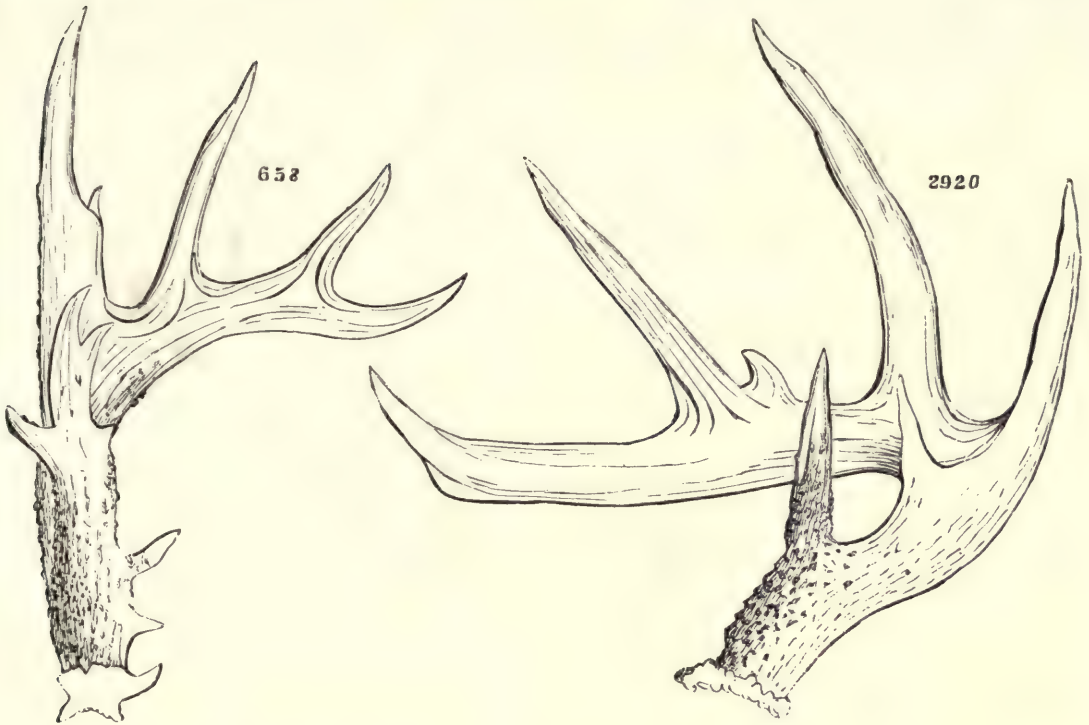


Fig. 14. *Cervus leucurus*. No. 2920. Yellowstone river. Right horn from inside. Size, 3.68 inches to the inch.

Fig. 15. *Cervus leucurus*. No. 658. Upper Missouri. Left horn from inside. Size, 5.04 inches to the inch. The horn is remarkable for the amount of flattening, and consequent elongation antero-posteriorly, of the cross section at any point.

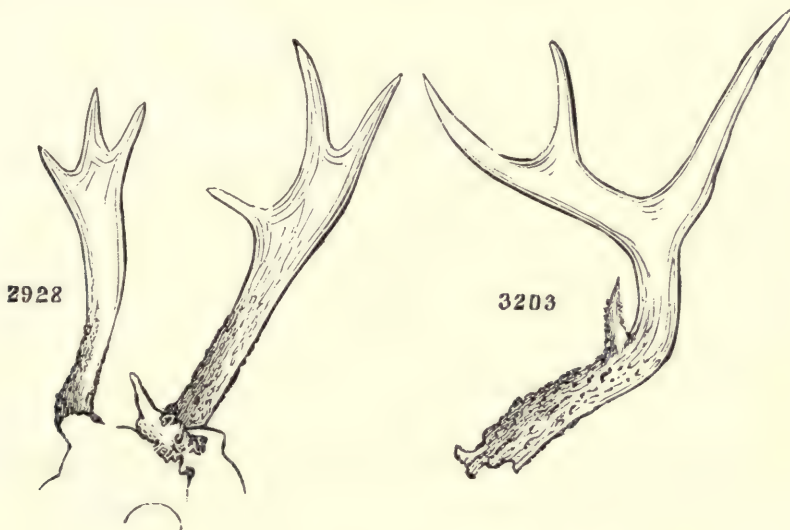


Fig. 16. *Cervus leucurus*. No. 2928. White Earth river, Nebraska. Both horns from the left. Size 3.91 inches to the inch. This horn is much compressed antero-posteriorly, at its terminal or upper half, as in the moose or reindeer. It may possibly be a *C. macrotis*, but is labelled by Lieutenant Warren *C. virginianus*, and most probably is the white-tailed deer of the Upper Missouri.

Fig. 17. *Cervus leucurus*. No. 3203. Whidby's island, Puget's Sound. The true *C. leucurus* of Douglas. Right horn from inside. Size, 5.09 inches to the inch.

The only skin before me from any point near to the original locality of *C. leucurus* is a portion of a hide sent from Steilacoom by Dr. Suckley. It has the general appearance of the *C. virginianus*, but is considerably redder, the annulation more distinct, on a darker ground,

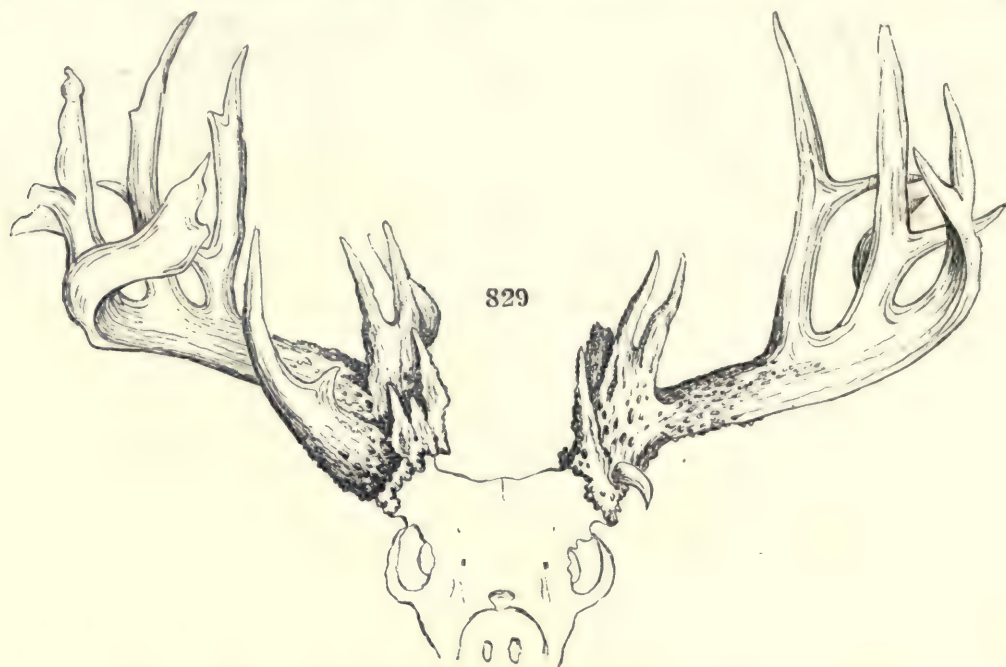


Fig. 18. *Cervus leucurus*. No. 829. Big Sioux, Nebraska. Head from before, showing a remarkable development of points. Size, 6.20 inches to the inch.

and the hair generally fuller, longer, and finer. There is a decided deepening of color along the dorsal line. Thickly interspersed among the other hairs are numerous single ones entirely white. There is quite an appreciable difference in the color of the hair.

To give the full history and characters of this deer will require a larger amount of material than that at present at my command, although I have little doubt of its difference specifically from the Virginia deer. Whether the skins I have described from the Missouri and Platte are really the same with those from the Columbia river and Puget's Sound, is far from being satisfactorily ascertained. One thing is certain, that the former are by no means characterized by great length of tail; this, as far as I can judge, being but little longer than in the *C. virginianus*. In none of the skins does it exceed twelve or fourteen inches. The *Cervus macrourus* of Rafinesque, based upon the vague description of Lerye, probably refers to the Missouri white-tailed deer, although the indication of 18 inches as the length of the tail is probably an error. Should the species of the Missouri and Columbia be distinct from each other, as well as from the Virginia deer, I would suggest that the name *macrourus* be retained for the first mentioned; though if the two former are the same, *leucurus* had better be used, as most eligible under the circumstances.

This species is very abundant on the Upper Missouri and Upper Platte, where it replaces the Virginia deer. It probably extends along the eastern plains of the Rocky Mountains into Texas, but in Sonora appears to be replaced by the *Cervus mexicanus*. If the same with the Oregon species, it is found all along the Columbia river, as well as on Puget's Sound.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								Nose to occiput.	Nose to tail.	Tail to end of vert.	Tail to end of hairs	
?1478	.....	.....	Steilacoom, W. T. ....	.....	Dr. G. Suckley.....	.....	Piece of skin	.....	.....	.....	.....	.....
1889	2587	○ ○	Medicine Bow cr., W. Fork	Sep. 6, 1856	Lt. F. T. Bryan.....	322	Skin	9.50	40.00	8.00	10.00	W. S. Wood...
1887	2585	○ ○	South Platte.....	Sep. 9, 1856	do.....	327	do	9.00	33.50	8.00	11.00	do.....
1888	2586	○ ○	do.....	Sep. 10, 1856	do.....	329	do	10.50	39.50	8.50	10.50	do.....
1885	2583	○ ○	do.....	do.....	do.....	328	do	17.58	78.00	12.00	15.00	do.....
1886	2584	○ ○	do.....	Sep. 7, 1856	do.....	326	do	12.50	51.00	9.00	13.00	do.....
1891	2589	○ ○	Platte river.....	July 18, 1856	do.....	120	do	8.00	37.00	7.00	8.50	do.....
?1890	2588	○ ○	Republican Fork.....	Oct. 9, 1856	do.....	375	do	13.25	59.00	11.00	13.50	do.....
1837	2879	○ ○	Upper Missouri.....	Sep. 5, 1856	Lt. G. K. Warren.....	.....	do	.....	.....	.....	.....	Dr. F. V. Hayden
1839	2878	○ ○	White Earth river.....	Sep. 8, 1856	do.....	.....	do	.....	.....	.....	.....	.....do.....
2038	2873	○ ○	Yellowstone.....	Aug., 1856	do.....	.....	do	.....	.....	.....	.....	.....do.....
1831	2509	○ ○	Blackfoot country.....	do.....	do.....	.....	do	.....	.....	.....	.....	.....do.....
?1714	.....	○ ○	Pecos river.....	July 4, 1856	Capt. J. Pope.....	203	.....	.....	.....	.....	.....	.....do.....

CERVUS MEXICANUS, Gmelin.

Sonora Deer.

Cervus mexicanus, GMELIN, Syst. Nat. I, 1788, 179.

LICHTENSTEIN, Darstellung, 1827-1834; pl. xviii.

WAGNER, Suppl. Schreber Säugt. IV, 1844, 378.—IB. V, 1855, 375.

PUCHERAN, Mon. du Cerf, Archiv du Mus. VI, 1852, 362.

GIEBEL, Säugt. 1855, 340.

Cervus (Mazama) mexicanus, SUNDEVALL, K. Sv. Vet. Ak. Handl. for 1844, 182.—IB. Archiv Skand. Beit. 1850, 135.
(original description.)

SP. CH.—Resembling *C. virginianus* in horns and general characters, but smaller. Color varying but little with season; ashy or grayish brown, pointed with light gray annulation to the hairs. Tail but little longer than the ears, white beneath and on the sides; whitish with yellowish rufous tinge above, except near base, where it is like the back. Gland on hind leg as long as the bone is thick.

The single specimen collected of this deer is of very small size, though fully adult, as shown by its suckling a fawn when killed. No experiment was made as to its weight, but this could not have exceeded 70 pounds, as Dr. Kennerly, after killing it, threw it across a mule with perfect ease.

The general impression conveyed of this deer is that of *Cervus virginianus* in winter dress, though the specimen was killed in May, and in summer fur. The head is slender and delicate. The ears are moderately long and rather unusually broad; they measure $5\frac{1}{2}$ inches above the notch and $4\frac{1}{2}$ in width. They are rather thinly coated with hairs on both sides, though the hairs are much longest on their concavity or interior.

The larmiers are not very large, and the space between them and the eye is covered with short velvety hairs. There are no appreciable peculiarities in the form of the muzzle.

The tail is short, but little longer than the ears; it measures only about 7 inches to the tips of the hairs, and about four to five to the end of the bone. It is depressed and hairy beneath.

The hoofs are rather short and broad. In the hind foot the width of the side, measured along

the line of junction of the hair, is about three-fourths the length along the upper edge. The extreme width of the entire hoof is about four-fifths this length. In the fore hoofs, the length along the upper edge, is a little less in proportion to the other dimensions than in the hind legs.

The gland on the hind leg is much as in *C. virginianus*. It is situated along the middle of the bone, and is rather longer than the bone is wide; it is narrower than in *C. virginianus*, but perhaps longer. It is surrounded by a dense tuft of hair a little lighter than on the rest of the leg, but otherwise not so conspicuously different as in *C. virginianus*.

The prevailing color of this animal is an ashy brown, pointed with light gray or dull whitish. The hairs themselves are generally light gray at the base, the terminal portion becoming of a pure brown, (without any shade of red or yellow,) darkest near the tip, where it is rather broadly annulated with light gray, clearer than at the base, and with perhaps a faint tinge of yellowish. The under surfaces are lighter; the only pure white appears to have been in the inguinal region. The tail is entirely white beneath and all round. At the base above it is gray like the back; the subterminal portion is whitish with a pale rufous tinge. The bases of the hairs above, however, except perhaps at the extreme end of the tail, are dark brown, darkest towards the tip.

The head, including the convexity of the ears, presents the same grayish or pepper-and-salt color of the rest of the body. The end of the muzzle is encircled by a dusky ring passing just behind the naked muffle; this ring is quite distinct on the side of the lower jaw, but for the rest is rather obsolete, being replaced by a grayish shade. The side of the muffle on either side of the nostrils and the tip of the chin are white. There is an increased amount of light in the mottlings of the muzzle just behind the dark band referred to, but no distinctly light ring. The under surface of the head is white.

No reliable measurements of this specimen can be taken, owing to the shrivelled state of the skin. It is not more than two-thirds as large, however, as the female *C. virginianus*, and may be still smaller.

This species, now for the first time included within the limits of the fauna of the United States, has, as already stated, many points of close relationship with the *C. virginianus*. It differs from it, however, in its much smaller size, shorter and whiter tail, grayer color, and other features. The colors are much grayer than in any winter *C. virginianus* I have ever seen, exhibiting no trace of the rusty or chestnut of the latter. The hoofs are shorter, broader, and higher. The tail is considerably shorter and lighter above, exhibiting no exposed black whatever. The ears are thinner. The head generally is much more uniform in its markings than in *C. virginianus*.

I regret that no horns of this species were brought home, and that the single specimen is in such condition as to prevent any very accurate description. There is some doubt as to whether it is the true *C. mexicanus* of authors. I shall, however, apply the name provisionally.

It is a little curious that this species, which, from the testimony of Dr. Kennerly, does not change color materially with the season, should present, as the permanent color in its southern clime, a grayish tint that resembles most closely the winter color of *C. virginianus*. A similar analogy is seen in the mottled owl; the *Scops asio* of the north, like the deer, being found both red and gray, (in the same season, however,) while its southern representative, *Scops McGalli*, from the Rio Grande, like the Sonora deer, is exclusively gray.

Much still remains to be done in defining with precision the characteristics of the smaller deer of America, and in the discrepancy of descriptions of authors there is some doubt as to whether the present specimen is really the *C. mexicanus* or not. It agrees sufficiently, however, with this animal, as described by Lichtenstein, Wagner, and other writers, and in its geographical position is not very remote from the region assigned by these authors to the Mexican deer. The new Gadsden boundary line between the United States and Mexico probably marks its extreme northern range. Southward it extends through the wooded mountain region of Mexico, beyond the city of Mexico.

The horns of this deer are described as resembling the *C. virginianus*, but, perhaps, with fewer points. The following measurements of a buck are taken from Lichtenstein:

	Feet.	Inches.
Total length to root of tail.....	4	9
Length of tail.....		6
Head to between ears.....	1	
Horn, from the burr to the tip of the posterior point..... anterior point.....		9½ 11½
Length of ears.....		5½
Width of ears.....		3¾
Height of body anteriorly	2	9
posteriorly.....	2	10

The female is smaller than the male.

The characteristics which distinguish this species from the *C. virginianus* will also serve to separate it from the *C. leucurus*, such as its different color, very small size, short tail, &c. They agree in the slightly marked character of dusky band across the end of the lower jaw.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.	Collected by—
1048	2360	♀	San Luis Springs, Sonora.	May, 1855....	Maj. W. H. Emory...	Skin.....	Dr. C. B. Kennerly.

CERVUS MACROTIS, Say.

Mule Deer.

Cervus macrotis, SAY, Narr. of Long's Exped. II, 1823, 88.

HARLAN, F. Am. 1825, 243.

GODMAN, Am. N. H. II, 204.

PEALE, Phila. Advocate of Science, I, Aug. 1834, 11; figure.—*Id.* Mammalia and Birds U. S. Ex. Ex. 1848, fig. of hoof.

WAGNER, Suppl. Schreb. IV, 1844, 371, (in part only).—*Id.* V, 1855, 368.

PUCHERAN, Mon. Cerf, Archiv du Mus. VI, 1852, 369.

GIEBEL, Säugt. 1855, 342.

Cervus (Cariacus) macrotis, GRAY, Knowsley Menagerie, Ungulata, 1850, 67.—*Id.* Pr. Zool. Soc. XVIII, 1850, 239.

"*Cervus auritus*, WARDEN, Hist. U. S. V, 640, French edition," (fide Richardson.)

Mule deer, LEWIS & CLARK.

SP. CH.—Larger than *C. virginianus*. Horns doubly dichotomous, the forks nearly equal. Ears nearly as long as the tail. Gland of hind leg half as long as the distance between the articulating surfaces of the bone.

In winter, ashy brown with light gray tips and annulations. Beneath, like the back, except about axillae and groin. Entire rump with basal two-thirds of tail all round white. The tail is cylindrical, a little longer than the ears, very slender, naked beneath, except at the end, which is a black tuft.

The *C. macrotis* appears to be considerably the largest of our American deer, after the elk, exceeding the *C. virginianus* and *C. lewisii* very appreciably in size. From the examination of the portion of a skin brought by Dr. Newberry, I am unable to substantiate the distinctions in the hoof from *C. lewisii*, as stated by Mr. Peale in the report of the Wilkes' Exploring Expedition. In fact, the character there given of a broad hoof to the former, and a narrow one to the latter, are completely inverted by my comparisons, the *C. macrotis* having a very long and slender sole, very different from that of the elk. The gland of the hind leg is very large, fully twice as long as the hind hoof, measured along its upper surface; its lower end is distant by its whole length from the lower articulating surface of the bone, in which it is placed. It occupies two-fifths of the distance between the upper and lower articulating surfaces of the bone, falling on the second and third fifth of the bone, starting from the upper articulation.

The hoofs of this specimen are long, slender and tapering; in the fore foot the side along the line of hair is about two-thirds the length of the upper edge, and nearly half this length in the hind foot. The greatest width between the exterior of the first hoofs is about two-thirds the length of their upper edge; in the hind foot about four-sevenths, or nearly the width of the outer side of the hoof.

The skin of the head exhibits in a marked degree the propriety of the name *macrotis*, the ears measuring seven inches from the notch, and standing, when fresh, according to Dr. Newberry, eight inches above the head.

The hair is very coarse and brittle, resembling that of the antelope. The winter coat is very dense and full, almost shaggy, and without the compact smooth character of *C. virginianus* in winter dress. The ears are particularly well coated with hair, resembling somewhat those of a Newfoundland dog.

The prevailing color of the adult is an ashy brown, pointed or varied with gray, and without any rusty tinge whatever. There is a distinctly marked stripe from the crown of the head to the root of the tail, the hairs in which are much darker throughout their extent than

elsewhere. The under parts generally appear to be ashy brown, like the back, but without annulation of the hairs. The only whitish portion of the inferior surface is seen beneath the head, around the axillae, and in the groin. On each side of the tail, on the end of the rump, is a dull white patch, crossing above the tail and involving its entire basal half or two-thirds. The tail itself is quite slender and cylindrical on the basal two-thirds; the hair there being compact and close and then expanding into a dense tuft, which is entirely black. A narrow line along the under surface of the tail, which in summer is quite naked, in winter is thinly coated with hair. The legs are of a yellowish rusty. The ears are of a sooty tinge along the edges of both margins, the centre and basal portion of the concavity being white, that of the convexity like the back; there is a whitish patch in the basal portion of the outer edge behind. The muzzle presents a hoary appearance; on each side of the naked muffle is a black spot, seen also on the side of the lower jaw, anterior to these the muzzle is white.

The horns of a mule deer, from Fort Union, at the mouth of the Yellowstone, are, in shape, almost precisely like those of one specimen of *C. columbianus*, from San Francisco. They are doubly and nearly equally dichotomized. The first fork falls a little short of the middle of the antler, the second fork of each branch falls a little beyond the first third of the remaining distance. The posterior fork is rather the larger of the two. There is a small point on the upper edge of the antler, midway between the base and the first fork.

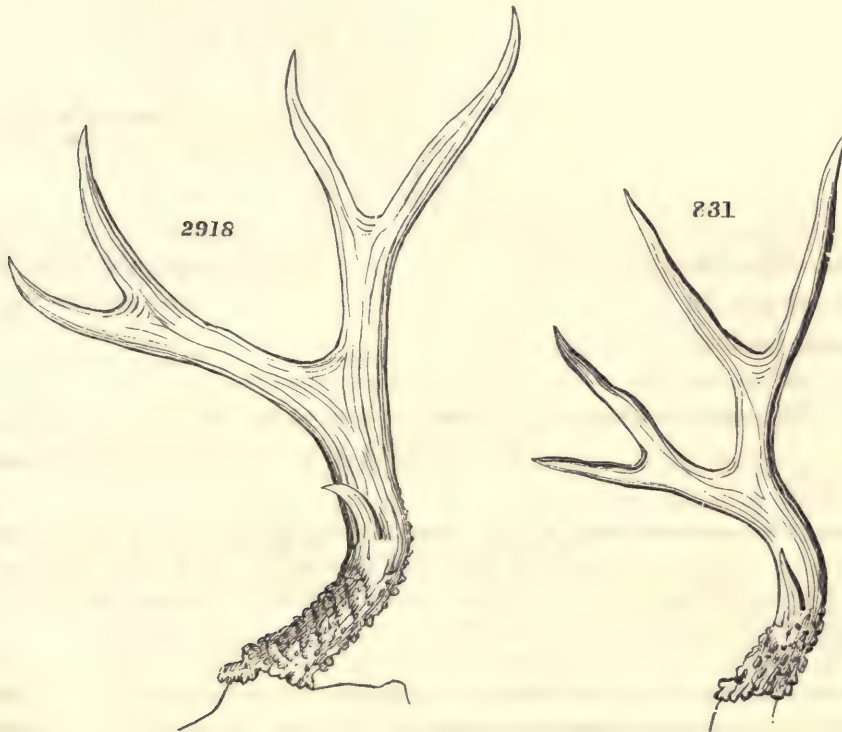


Fig. 19. *Cervus macrotis*, No. 831. Big Sioux, Neb. Right horn from inside. Size, 8.23 inches to the inch.

Fig. 20. Same species, (2918.) Yellowstone. Right horn from inside. Size, 5 inches to the inch.

This species was first described by Say, from specimens killed in the Cedar ridges, on the head waters of the Arkansas, near but not in the Rocky Mountains. Whether the mule deer of the Missouri and Saskatchewan and of the Des Chutes is identical with this cannot, at present, be determined, for want of specimens. There are certain discrepancies not easily reconciled in the various indications of the supposed *C. macrotis*. One of some importance is that of the hoof, which is said, by Mr. Peale, to be broad and cordate in the original *C. macrotis*, while in Dr. Newberry's specimen, as well as those from the Upper Missouri, it is unusually narrow and linear, exceeding, in this respect, *C. virginianus*.

The characters of the horns, the long ears, the white buttocks, the elongated gland of the hind leg, and the black-tipped tail, with its other peculiarities, will at once distinguish *C. macrotis* from the *C. virginianus*, not to mention its much greater size. From *C. columbianus* it is known by its greater size, the graver colors, the long gland of the hind leg, the white buttocks and base of tail, the concentration of black on the tail in a small tuft at tip, the longer ears, the absence of the frontal mark, &c. The tail is very differently constituted in being cylindrical and attenuated, except at the tufted tip, instead of being uniformly full and bushy.

I have before me only an imperfect summer skin of *Cervus macrotis*. In this the character of the hair is much like that of *C. virginianus* in its thin, coarse, scant character. The color is of a yellowish tawny or mud color, much lighter than in *C. virginianus*. The individual hairs are nearly uniform brownish yellow from the base, without any terminal annulation whatever.

In the accompanying note¹ I give the description of this deer from life, as prepared by Prince Maximilian during his visit to the Upper Missouri. It will be found to contain some interesting details not to be derived from the examination of the dried skin. The animal has its greatest development in point of numbers on the Yellowstone river, and the list of specimens below expresses very nearly what is known of the distribution of the species. It is not yet ascertained with certainty whether it is found north of the American line.

In a large number of specimens, received since the preceding description was prepared, I still fail to find anything in the hoofs resembling the elk; these, in fact, are every way as long and acute (if not more so) than in the Virginia deer.

¹ *Cervus macrotis*, Prince Maximilian, Reise in das innere Nord-Amerika, I, 1839, 404.

The black-tailed deer is larger than the Virginia, and more stoutly built; the hoofs are larger; ears much longer; the spring is not as light nor the gait so rapid; in fact, the speed is not greater than that of a Buffalo cow. In running the black-tailed deer does not carry the tail erect, like the Virginia deer, nor does it wag this member from side to side, as in the last mentioned species. The rutting season is in September; the horns are cast in March, and are perfected again in August. The usual number of young is one, though sometimes two are dropped. These are spotted with white on a pale yellowish red ground, and the tail is formed as in the adult.

Description of a buck of eight tips, from three to four years old.—Shape somewhat like that of the Virginia deer, but the top of the nose seems a little more arched. Eyes with a decided sinus lachrymalis; ears very large and broad; frame considerably higher behind than before; legs and hoofs as in the Virginia deer; the hoofs, however, are larger, particularly the hinder ones, which stand wide apart. The tail is thin and nearly naked beneath and on the sides; it is short haired above, with a small black bushy tip; scrotum sparsely haired; penis long and cylindrical, a little depending at the tip.

The hair on the body is hard and scant; the whole body is pale yellowish red, more of a grayish brown under the anterior part of the body; under the belly whitish yellow; inner sides of the legs whitish. Ears yellowish gray exteriorly, darker towards the tip.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Measurements.				Collected by—
								Nose to occip.	Nose to tail.	Tail to end of vert.	Tail to end of hairs.	
1840	2881	♂	Upper Missouri	Summer, 1856	Lt. Warren.....	B	Skin .....	.....	70.00	8 00	12.00	Dr. F. V. Hayden.
1841	2882	♂	do.....	do.....	do.....	A	do.....	.....	.....	.....	.....	.....do.....
1852	.....	♂	Yellowstone.....	August, 1856	do.....	.....	.....do.....	.....	.....	.....	.....	.....do.....
1501	2351	♂	Sage Creek, Nebraska.....	Winter, 1855	Dr. F. V. Hayden ..	.....	.....do.....	.....	.....	.....	.....	.....do.....
1502	2362	♂	do.....	do.....	do.....	.....	.....do.....	.....	.....	.....	.....	.....do.....
1505	2365	♂	do.....	do.....	do.....	.....	.....do.....	.....	.....	.....	.....	.....do.....
1483	2581	♂	W. fork Medicine Bow Creek	Sept. 2, 1856	Lt. F. T. Bryan	316	do.....	15 00	69.50	8 00	11.00	W. S. Wood.....
1884	2582	♂	do.....	do.....	do.....	317	do.....	11.00	57.00	6.50	10.00	 do.....
1200	2028	♂	Head of Des Chutes river, O. T.	September, 1855	Lt. Williamson.....	.....	Head & feet .....	.....	.....	.....	.....	Dr. J. S. Newberry

NOTE.—The measurements recorded above were taken before skinning.

CERVUS COLUMBIANUS, Rich.

Black-tailed Deer.

Cervus macrotis, var. *columbianus*, RICHARDSON, F. B. Am. I, 1829, 255; pl. xx.

Cervus macrotis, RICH. F. Bor. Am. I, 1829, 254; pl. xx.

SUNDEVALL, K. Sv. Vetenskaps Akad. Handlingar, 1844.—Ib. Archiv Skand. Beit. II, 1850, 135. (From Richardson.)

Cervus lewisii, PEALE, Mammalia and Birds U. S. Ex. Ex. 1848, 39.

? *Cervus (Cariacus) lewisii*, J. E. GRAY, Pr. Zool. Soc. Lond. XVIII, 1850, 239.—Ib. Knowsley Menagerie, 1850, 67 pl. xlv, summer; pl. xlv, winter.

Cervus richardsonii, AUD. & BACH. N. Am. Quad. II, 1851, 211.—Ib. III, 1853, 27; pl. cvi.

WAGNER, Suppl. Schreb. V, 1855, 369.

? *Cervus (Cariacus) punctulatus*, GRAY, Pr. Zool. Soc. Lond. XVIII, 1850, 239; pl. xxviii.—Ib. Knowsley Menag. 1850, 67.

Black-tailed fallow deer, LEWIS & CLARK.

SP. CH.—About the size of *C. virginianus*, or less. Horns doubly dichotomous, the forks nearly equal. Ears more than half the length of the tail. Gland of the hind leg about one-sixth of the distance between the articulating surfaces of the bone. Tail cylindrical, hairy and white beneath; almost entirely black above. The under portion of the tip not black. Winter coat with distinct yellowish chestnut annulation on a dark ground. Without white patch on the buttocks. There is a distinct dusky horse-shoe mark on the forehead anterior to the eyes.

The differences between this and the Virginia deer are very strongly marked and readily appreciable. It is with the *Cervus macrotis* of Say that its closest affinities exist, and to distinguish

The horns had four tips on each antler, arranged somewhat as in *C. claphus*, except that the frontal tines are short and small, placed more internally, and tending outwards; then follows a very long tine curving upwards, (this in older deer divides); above this is a fork.

Measurements.—From snout to tip of tail, 5 feet 9 inches 8 lines; tail to tip of hairs, (measuring on the upper side,) 10 inches 8 lines; tail without the hairs, 6 inches; head, 12 inches 8 lines; length of ear, measured on the side next to the head, 8 inches 7 lines; greatest width of ear, 3 inches 2 lines; height anteriorly, (feet outstretched,) 2 feet 9 lines; height behind, 4 feet 3 lines.

In a two year old female the color is the same as that mentioned above, although rather a purer clear yellow. There are four inguinal teats; ears dark gray at the tips.

it from which some extent of detail is necessary. Both have very long ears, the same bifurcation of horns, and somewhat similar colors. What the differences really are will be hereafter mentioned.

In the absence of any but much wrinkled and corrugated skins, I cannot give any minute detail respecting the character of the muzzle, lachrymal openings, &c. The former appears much like that of the Virginia deer. The lachrymal openings are very large, commencing about half an inch in front of the eye, and are nearly three-quarters of an inch in length. The space between them and the eye is bare of hairs. The ears are large, measuring over $6\frac{1}{2}$ inches from the notch; the breadth is about five inches or more. Both surfaces are well covered with hair, though this is not very long or dense. The tail is rather short and thin, not bushy, and scarcely as long or not longer than the head. It is covered with hair beneath.

The limbs are slender, perhaps more so than in the *C. virginianus*. The hoofs are rather short and broad. In the fore foot, the width on the side along the line of hair is about three-fourths the length of the upper edge, and about two-thirds the same length in the hind foot. The greatest width between the exterior of the hoofs, in the fore foot, is about six-sevenths of the length of the upper edge of the fore hoof; that of the hind foot is about three-fourths the length of the hind hoof. There is no gland on the fore leg; that on the hind leg is about the length of the upper edge of the hind hoof, and situated on the outside, a little within the posterior edge. It is, however, so densely overgrown by the hair as to be with some difficulty detected in the dried skin. It occupies about one-sixth of the distance between the articulating surfaces of the bone on which it is placed, its lower end about two and a half times its own length from the lower articulating surface, the upper end about twice its length from the upper articulating surface, and its middle point is nearly midway between the two articulating surfaces of the bone, (a little nearer the upper one.)

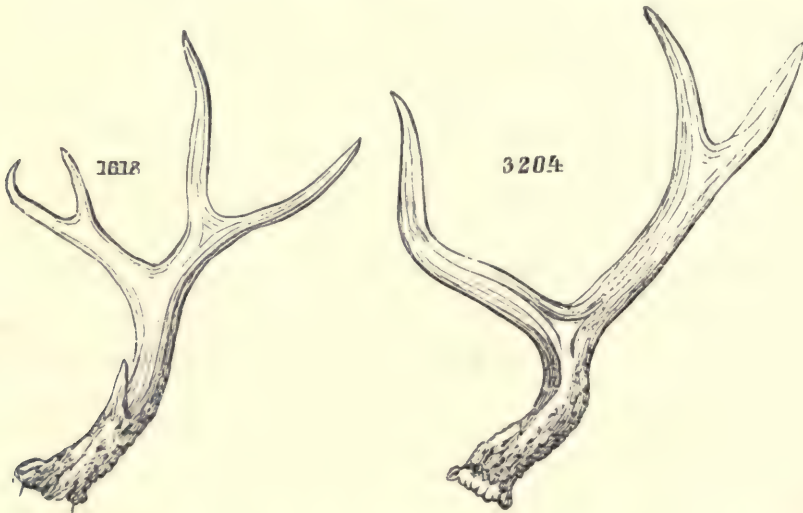


Fig. 21. *Cervus columbianus*, No. 1618. Monterey, Cal. Right horn, from inside, size 8.30 inches to the inch.

Fig. 22. *Cervus columbianus*, No. 3204. Puget's Sound. Right horn, from inside, showing the absence of fork on one side, as well as of basal snag. Size, 5.74 inches to the inch.

The horns of this species, when fully formed, are quite different from those of the Virginia deer, and almost identical in character with those of *C. macrotis*. They rise from a well developed pedicel above and behind the eyes, and bifurcate almost equally before reaching quite half their length. Each branch bifurcates again near its middle; the anterior tine in each secondary fork is rather the longer of the two. The posterior secondary fork is rather larger than the anterior. Midway between the forehead and the first fork is a small tine of a few inches, situated a little forward of the postero-internal edge. There are thus but five points. The essential character, then, is that of a nearly equal bifurcation of the horns near the middle, and a second bifurcation of these forks in their middle, the posterior fork rather largest, and the anterior point largest in each. The *Cervus virginianus* has the same brow point, but the other points are all sent off from the posterior edge of the main stem, instead of bifurcating nearly equally. In some specimens the brow antler is entirely wanting, and it often happens that even in old bucks there is but a single bifurcation of the horn. In most cases there is a greater or less amount of warty roughness at the base of the antlers, less, however, than in *C. virginianus*.

In some cases there is an erect snag a little above the base; in others this is wanting. Sometimes there is only one fork; sometimes one branch of one or other fork is wanting, leaving but three terminal points.

The hair in the winter coats is shorter, thinner, and considerably finer than in *C. virginianus*, and lies very close to the skin.

The general color of this deer in winter is a yellowish chestnut, finely mottled with black. This black is concentrated and intensified along the dorsal line, so as to produce an appreciable and broad streak from the occiput to near the root of the tail, less distinct in some, however, than in others. The neck all round and the exterior of the thighs and shoulders and the sides are much like the back, but rather lighter. The under parts, from between the legs to the umbilicus, are mottled like the back, with a strong sooty tinge on the chest. Towards the navel, however, this mottling is confined to the ventral line, on each side of which is a lighter region, separating it from the colors of the flanks. The axillae and upper half of the inside of the fore leg, the posterior part of the belly, and the inside of the thighs, are white. The lower half of the legs is of a chestnut tinge, (lightest inside,) lighter than the back, and without any black.

In the head the chestnut tints are more or less replaced by grayish, especially on the ears and upper part of the muzzle. The top of the head is chestnut and black, but there is a very decided dark stripe over each eye, converging anteriorly, and meeting in the middle of the forehead. The end of the chin and the sides of the naked muffle are white; behind this is a black patch, crossing and involving the posterior half of the muffle and passing round on the chin, where it is most distinct on the edges of the lips. In some cases it forms a more or less obsolete border only to the white of the apex of the chin, occasionally interrupted towards the centre. Posterior to this dusky circle on the chin is a space similar to and continuous with the light mottled chestnut of the side of the head; behind this, for a space corresponding with the area between the rami of the lower jaw, the color is a dirty white, as are also the concavity of the ear and the base of the ear posteriorly, and extending a little way up.

The tail is entirely covered with hair, uniform jet black above, except near the base, where it

shades into the color of the back; beneath, it is entirely white, although very little of this is seen when viewed from above.

The mottled hairs, examined individually, are nearly black, with a subterminal annulus of bright yellowish chestnut, very distinctly defined; the basal portion is cinereous. The black colors predominate on the back, the cinereous on the sides. The annuli are about $\frac{1}{16}$ of an inch long on the back, where they are narrowest, and widen to about a quarter of an inch on the sides and on the shoulders.

I have not had an opportunity of examining any but winter skins of this animal; the summer coat is much lighter, according to Dr. Newberry, being of a nearly uniform fulvous brown, and the colors generally less distinct. According to Dr. Gray, of the British Museum, the summer hairs are not ringed at all.

There is great uniformity in all the skins as to color, the only difference being in a specimen from Monterey, in which the subterminal annulus on the hairs is much lighter. Specimens from San Diego are considerably smaller than those further north, following the same rule with the Virginia deer.

The *C. columbianus* is readily distinguishable from the other American species. Its horns and color are entirely distinct from *C. virginianus*. Its affinities are closer to *C. macrotis*, having much the same horns; it is smaller, however; its general color is darker; it has a dusky border to the forehead, and is without the white patch on the rump. The hair is finer. The gland on the leg is shorter. My comparisons of the hoofs with those of Dr. Newberry's specimen of *C. macrotis* lead me to different conclusions from Mr. Peale, as I find them to be shorter, broader, and higher, and thus more cordate beneath, in *C. columbianus* than in *C. macrotis*.

This species was first brought to the attention of naturalists by Lewis and Clark, who called it the black-tailed fallow deer of the Pacific, fully appreciating its differences from the mule deer of the Missouri. For many years, however, it was without a scientific name, owing to the general impression that it was the same with the *Cervus macrotis* of Say. Dr. Richardson unwittingly described specimens in the museum of the Zoological Society as the *C. macrotis*, his description agreeing very accurately with the subject of the present article. He figures a fine specimen of rather unusual development of horns, and the plate and description of Audubon and Bachman are likewise taken from the same animal.

In 1848, Mr. Peale described this species as *C. lewisii*, having been the first naturalist who fully understood the relations between it and *C. macrotis*. For this he was well fitted, having been with Mr. Say when, in 1817, the *Cervus macrotis* was discovered near the Rocky Mountains. Audubon and Bachman subsequently described it as *C. richardsonii*.

Richardson, however, in 1829, gives a notice of Lewis and Clark's black-tailed deer, under the name of *Cervus macrotis*, var. *columbianus*, referring to the article of the above authors. This it would seem proper to retain as being really a scientific name for the black-tailed deer, even though not supposed to be entitled to full rank, but only as a variety of *C. macrotis*. Where an author considers an animal as a variety of some other, and gives to it a suitable systematic name, as such, it would seem but right and proper, if a species is to be established, to take the name already prescribed, rather than to increase the list of synonyms by a new one. The same principle will apply equally well when a sub-genus is to be raised to the rank of a genus.

I am in some doubt as to the true characters of the *Cervus lewisii* and *punctulatus* of J. E. Gray. The former is described as very similar in its horns to the *C. virginianus*, but wanting the basal snag. Now, the basal snag is more frequently present than absent, and the horns are unlike those of *C. virginianus*. The most essential characteristics of the species are omitted. A similar uncertainty applies to the *Cervus punctulatus*. I have not at hand his figures of either species, and cannot therefore use them in ascertaining whether they are synonyms here, or of *C. leucurus*, but have provisionally placed them with *C. columbianus*.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Collected by—
1487	-----	♂	Oregon -----	-----	U. S. Ex. Ex. -----	---	Skin -----	Titian Peale, esq. --
1488	-----	♀	do -----	-----	do -----	---	do -----	do -----
1950	2618	♂	Steilacoom, W. T. ---	Mar. 26, 1856	Dr. G. Suckley -----	90	do -----	-----
1479	2299	♂	do -----	Feb., 1856	do -----	C	-----	-----
	2034	---	Shoalwater bay, W. T. ---	-----	Dr. Cooper -----	---	Skull -----	-----
1192	2083	♀	San Francisco, Cal. ---	Nov., 1855	Lt. Williamson -----	---	Skin -----	Dr. J. S. Newberry --
1193	-----	♂	do -----	do -----	do -----	---	do -----	-----
1485	-----	♂	do -----	-----	Lt. Trowbridge -----	---	do -----	-----
	2429	---	San Diego, Cal. -----	-----	Dr. J. F. Hammond -----	---	Skull -----	-----

FAMILY.

CAVICORNIA.

Ruminants with the horns permanent, hollow, and enclosing a process of the frontal bone. Incisors, $\frac{0}{8}$; canines, none; molars, $\frac{6-6}{6-6}$.

The above diagnosis in its first sentence expresses in brief terms the principal points in which the *Cavicornia*, or hollow-horned ruminants, differ from those with solid horns, the North American species of which have just been discussed.

I have not the time, nor is the present the occasion, to go into a general discussion of the various systems of classification proposed by authors for the animals of the present group. In the limited number of species inhabiting North America, it will be sufficient to state, that, of the several divisions of the family, namely, the antelopes, the goats, the sheep, the musk oxen, and the bulls, America possesses a representative of all, excepting the goats, the Rocky Mountain goat of authors being really an antelope. The following synopsis will serve to show how the different genera are related to each other.

A. ANTILOPINAE.—Horns rounded or conical, without sharp angles; variously curved; annulated or wrinkled. Muzzle elongated, attenuated, end of upper lip with a shallow groove; generally hairy.

Antilocapra.—False hoofs, none. Horns rounded and recurved at tip, broadly compressed at base, with an angular process in front.

Aplocerus.—With false hoofs. Horns conical, nearly erect, slightly recurved. Hair long and silky.

B. OVINAE.—Horns more or less angular and compressed, usually twisted and curved backwards, wrinkled. Muzzle broader than in the last; hairy, except sometimes between the nostrils; with a shallow groove.

Capra.—Horns curving backwards. Head, without any lachrymal sinus. Nose for the most part straight in its upper outline; chin bearded.¹

Ovis.—Horns curved backwards, and variously twisted so that the tip is brought forwards again. Head with a distinct lachrymal sinus. Upper outline of nose curved. Chin without a beard.

BOVINAE.—Horns rounded. Muzzle broad, without any vertical furrow at the end, usually naked.

Ovibos.—Horns curving outwards and downwards. Muffle hairy, except between the nostrils.

Bos.—Horns curving outwards and upwards. Muffle entirely naked to the edge of the lip.

The number of species of the antelopes is very great, the latest list I have seen (that of Wagner, 1855,) embracing about ninety species: of these, two belong to North America, *Aplocerus montanus* and *Antilocapra americana*; two to Europe, the gazelle, *Antilope saiga*, and the chamois, (*Capella rupicapra*); nearly all the rest to Africa. It is not a little remarkable that the entire family of hollow-horned ruminants should be altogether wanting as original species in South America. Of the *Ovinæ*, including the sheep and goats, America has but one species, nearly all being confined to the mountainous portions of Asia and Europe. Of the *Bovinæ*, there are not many species, (about ten in all); two are North American, one European, the rest belong to Africa and Asia. The affinities of *Ovibos* are more strictly with the sheep, however, and a natural arrangement would probably place them there, as has been done by some authors.

¹ The common domestic goat is our only representative of this genus, the so-called Rocky Mountain goat being truly an antelope.

ANTILOCAPRA, Ord.

Antilocapra, ORD, Journal de Physique, LXXXVII, 1818, 149.

J. E. GRAY. Pr. Zool. Soc. Lond. 1850, 137.

AUD. & BACH. N. Am. Quad. II, 1851, 193.

Dicranoceros, HAM. SMITH, Griff. Cuv. V, 1827, 312.

Horns erect ; the base compressed, with a flattened process in front, the end conical, recurved. Nose ovine, entirely hairy at the end except a narrow central line. Tail very short. No false hoofs behind the large ones.

I have taken the above diagnosis from J. E. Gray, altering it, however, in respect to the end of the nose. This is described by him as hairy, without any muffle, as in the sheep, whereas, there is a narrow strip of naked skin extending from beneath the nostrils to the naked edge of the upper lip. In addition to the characters just stated, Dr. Gray mentions, among other peculiarities, that the fur is very close, the hair stiff, coarse, flattened and wavy ; the tear bag and inguinal pores wanting ; legs rather slenderer than in its allies, (*Nemorhedus*, *Capricornis*, *Aplocerus*, and *Rupicapra*, called goat-antelopes.) Skull without any sub-orbital depression, but with a lengthened fissure. Grinders without supplemental lobes ; cutting teeth equal sized and shelving.

The horns of the American antelope are very peculiar in the entire group, on account of the great compression of the basal portion of the horn with the prominent angular flattened process on its anterior edge. The absence of the small false hoofs at the back part of the feet, just above the regular hoofs, is also a very striking character. According to Prince Maximilian, (Wagner, Suppl. Schreber, V, 1855, 461,) a trace of one (never two together) of these false hoofs is sometimes seen in the fore feet. I have never detected any, however, in the skins which have fallen under my inspection.

According to Dr. Gray, the nearest ally to our American antelope is the European chamois (*Capella rupicapra*, or perhaps, rather *Rupicapra tragus*).

The generic name of *Mazama*, as established by Rafinesque in the American Monthly Magazine, II, 1817, 44, has been quoted by some authors for the American antelope as well as for the mountain goat and the smaller deer. An examination of his diagnosis will show very satisfactorily that the name cannot be used at all, on account of its embracing too many incongruous elements, as follows :

MAZAMA.—Eight front teeth in the lower jaw, none in the upper, no canine teeth, grinders truncated ; head with solid, simple, straight, round, and permanent horns, uncovered by a skin ; neck and legs not very long, cloven hoof. Tail short. Obs. This genus differs from *Cervus* by having simple permanent horns, from the genus *Giraffa* by not having a skin over the horns, nor a long neck, and from the genus *Gazella* by its horns not being hollow. It belongs to the family *Ruminalia*, sub-family *Stereoceria*, next to the genus *Giraffa*. It appears to be peculiar to America, and contains many species which had been taken for deer, sheep, antelopes, &c.

***Mazama tema*.** Raf.—Yellow brown above, white beneath. Horns cylindrical, straight, and smooth. This is the *Temamazame* of Mexico.

***Mazama dorsata*.** Raf.—Entirely white and woolly, a mane along the neck and back ; horns conical, subulate, acute, slightly curved backwards, base rough. Obs. This animal has been called *Ovis montana* by Ord, but the genus *Ovis*, or rather *Aries*, has hollow and flat horns, &c.

***Mazama sericea*.** Raf.—White with long silky hairs, no mane, &c. This is the *Rupicapra americana* of Blainville, but he has not ascertained the horns to be hollow.

Were the genus *Mazama* less decided in its expressions, it might be taken for either the antelope or the mountain goat, (better the latter,) but when we are positively assured that it differs from the antelopes in having solid horns, and from the deer, merely in the horns being

simple and permanent, instead of branched and deciduous, there is no alternative but to expunge the name from the systems, or to keep it until we find an animal with horns like the giraffe, only much longer, and not covered by a skin.

In reality, Rafinesque seems never to have seen, certainly never to have examined critically, the animals he refers to.

ANTILOCAPRA AMERICANA, Ord.

Prong Horn Antelope: Cabree.

Antilope americana, ORD. Guthrie's Geog. (2d Amer. edition) II, 1815, 292, 308.

HARLAN, F. Am. 1825, 250.

GODMAN, Am. N. H. II, 320.

DOUGHTY, Cab. N. H. II, 1833, 49; pl. v, (figure taken from Lewis and Clark's specimen, in Peale's museum.)

MAXIMILIAN, Reise in das innere Nord-Amerika, I, 1839, 403.

Antilocapra americana, OFD. Bull. Soc. Philom. 1818, 146.—IB. Journal de Physique, LXXXVII, 1818, 149.

J. E. GRAY, Knowsley Menagerie, 1850, 19.—IB. Pr. Zool. Soc. Lond. XVIII, 1850, 137.

AUD. & BACH. N. Am. Quad. II, 1851, 193; pl. lxxvii.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851 (1852); plate, (from Richardson.)

Dicranoceros americanus, TURNER, Pr. Zool. Soc. xviii, 1850, 174.

"*Cervus hamatus*, BLAINVILLE, Bull. Soc. Philomat. 1816, 73."

Antilope furcifer, HAM. SMITH, Trans. Linn. Soc. Lond. XIII, 1822, 28; pl. ii.—IB. Griff. Cuv. IV, 1827, 170; plate.

DESMAREST, Mamm. II, 1822, 479.

RICH. F. Bor. Am. I, 1829, 261; pl. xxi.

WAGNER, Schreber's Säugt. V, 1836; plate cclxxix, A.

GIEBEL, Zoologie; Säugt. 1855, 305.

Antilocapra furcifer, DESMAREST, Mamm. II, 1822, 479.

Antilope (Dicranoceros) furcifer, HAM. SMITH, Griffith's Cuv. V, 1827, 323.

WAGNER, Suppl. Schreb. IV, 1844, 403 — IB. V, 1855, 461.

Mazama furcifer, OGILBY, Pr. Zool. Soc. IV, 1836, 137.

Dicranoceros furcifer, SUNDEVALL, Kong. Sv. Vetensk. Handl. for 1844.—IB. Hornschuch, Archiv Skand. Beit. II, 1850, 268.

Antilope palmata, SMITH, Trans. Linn. Soc. XIII, 1822, 31; plate III, (horn.)—IB. Griffith's Cuvier, IV, 1827, 323.

DESMAREST, Mamm. II, 1822, 479.

OGILBY, Pr. Zool. Soc. Lond. IV, 1836, 121.—IB. Lond. & Ed. Phil. Mag. XI, 1837, 126.

WAGNER, in Schreber's Säugt. V, 1, 1836, 1250; pl. ccxlv, D,^o (horns.)

Antilocapra palmata, DESMAREST, Mamm. II, 1822, 479.

Antilope (Dicranoceros) palmata, HAM. SMITH, Griff. Cuv. V, 1827, 323.

?? *Ixalus probaton*,¹ OGILBY, Pr. Zool. Soc. 1836, 119, (Arctic America?)

? *Antilope anteflexa*, GRAY, Pr. Zool. Soc.

Teuthlalmagame, HERNANDEZ. (According to Berlandier.)

Berendo, of the modern Mexicans. (Berlandier.)

SP. CH.—Color above yellowish brown, or pale dun color; a narrow transverse band between the eyes, the top and sides of the muzzle, and a patch beneath the ear, (wanting in the female,) liver brown; edges of upper lip, chin and sides of face, spot behind the ear, a narrow crescent on the upper part of the throat, a triangular patch below this, the entire under parts and a square patch on the rump, white. Horns, hoofs, and naked parts of the nose, black.

Horns rudimentary or wanting in the female.

¹ Sundevall refers to this as the *Ovis ixalon* of Blythe, from Chile.

This animal is larger than the domestic sheep, while its proportionally much longer legs, and longer and more erect neck, give to it a much greater altitude.

The hair is everywhere very coarse, thick, and exceedingly spongy and easily torn apart ; it is tubular, slightly crimped or waved, and has much the appearance of short lengths of coarse thread, cut off abruptly at the extremity. I have not noticed any woolly hairs between the coarse ones just mentioned, though they may exist in winter skins.

The head is broad, much hollowed on the forehead, the ridge of the muzzle narrow, high, and convex ; the outline of the head very narrow and tapering. The horns are situated very far back, their posterior faces only about as far from the occiput as their own diameter. The orbits are nearly circular, and project much laterally ; they are situated almost immediately under the base of the horn, so that the eye does not pass beyond the anterior outline of the latter in the males. The horns themselves are much compressed antero-posteriorly, with a broad compressed pointed snag directed upwards and forwards (generally in the plane of the basal portion of the horn) ; beyond this anterior snag the horn becomes rounded and tapers to an acute and compressed tip ; when near the tip the direction of the horn, instead of being upwards with a slightly outward divergence, changes abruptly and bends inwards and a little backwards. The terminal portion of the horn is smooth and polished ; the basal, on the contrary, is generally warty, and roughened by angular tubercles of greater or less size.

There is a very considerable variation in the shape of the horns ; so much so, that authors have attempted to establish several species on some of their numerous modifications. Thus the basal portion is sometimes one-half the total length, sometimes one-third, sometimes two-thirds. The antero-posterior thickness of the horn is sometimes twice, sometimes thrice the transverse diameter. The anterior snag varies very much also. The curve or hook at the end of the horn is variable in its direction and angle, sometimes less, sometimes more than a right angle. The tip is generally compressed or flattened, and separated from the more conical portion by a conspicuous collar. In one instance the horn lacks the entire anterior snag, leaving the shape quite similar to that of the chamois, though without its annulated wrinklins. These variations are shown in an accompanying plate.

The female sometimes has no horns externally ; frequently, however, there is a short pointed horny tubercle of a few lines, occasionally two inches long. It does not show any curve, however, although usually warty at the base. When horns appear wanting in the female, they may sometimes be found concealed among the hair of the head.

The eye of this species is large and full ; there is no larmier either externally or in the skull. There is a prominent ciliation of bristles or eyelashes on the upper lid.

The end of the muzzle is hairy, only parted along the median line by a narrow naked space of about two lines, extending from the edge of the upper lip to the anterior end of the nostrils, then bifurcating and extending along the entire upper edge of the nostrils. The nostrils are much more horizontal than in the deer, and their anterior extremities more elevated above the edge of the lip, and much closer together, the septum measuring but little over a quarter of an inch.

The hoofs are similarly shaped on both feet ; the anterior rather largest. They are very narrow and acute, about three times as broad as long ; the lateral outlines nearly straight, the exterior even a little concave, very different from the deer. Their postero-external border,

however, viewed from the side, is about as long as the superior. There is not the slightest indication on either foot of the short supplementary hoofs above the others, usually seen in the ruminants.



Fig. 23. *Antilocapra americana*.—Male. End of muzzle, as seen from above and in front. (Taken from a well mounted head.)

Fig. 24. The under surface of left front hoof.

The tail is very short, almost rudimentary, measuring only a few inches. It is much flattened and densely covered with hairs, which have a distichous arrangement on the under surface.

The ears are long, narrow, and acuminate ; straight anteriorly. They are well covered with hairs on both surfaces. Their length, measured along the posterior outline, is about equal to the distance from the nose to the eye.

The prevailing color of the back and upper half of the sides is yellowish brown, with rather a hoary aspect. The entire under parts, with the exception of certain marks on the throat, are white ; this color extends up on the sides so as to occupy half the circumference, and be abruptly defined as a slightly waving line. The color of the back extends down on the thighs and outside of the forelegs so as to form nearly a right angle with the white region. There is a broad square patch of white on the posterior part of the back, commencing a few inches anterior to the tail as a transverse line, then passing backwards with nearly parallel sides, involving the whole of the buttocks as seen from behind, and continuous with the white of the belly and inguinal region. There is sometimes a reddish central line dividing this patch on the back, and extending to the tail, which is itself occasionally colored like the back, sometimes white. The size of the patch on the rump varies somewhat ; sometimes beginning as much as six or seven inches anterior to the tail.

There is a considerable variety of marking about the head and throat. Thus, the central half of the head is light yellowish brown above, pointed with dusky, and becoming paler on the sides. The sides of the head and the chin are white, this color commencing at the nasal septum and running, about an inch from the edge of the upper lip, backwards below the eye, and extending so far as to be separated from a white patch below the base of the ear only by a narrow isthmus of an inch. A very faint narrow reddish yellow line extends backwards from the angle of the mouth through this white patch, curving slightly upwards, and running into the tawny anterior to the eye. The lower part of the sides of the under jaw, for its posterior half, is like the back, but the colors of opposite sides are separated by an extension backwards of the white beneath the head. The neck all round may be described as of the color of the

back, except that there is a narrow crescentic patch of white on the throat, just back of the head, the branches extending high up on the sides; below this is a much narrower and longer patch of white, in the shape of an isosceles triangle, the base anterior. This is sometimes confluent posteriorly, with the continuous white of the lower throat and belly sometimes separated from it. On the back of the neck there is a low, compressed, narrow mane of dusky hairs, with a short indistinct light patch on either side back of the ears. The anterior half of the upper part and sides of the muzzle are of a uniform dark liver brown, in strong contrast with the white of the lips; there is also a narrow transverse band of the same across the forehead just anterior to the horns. The orbits are dusky. There is a dusky patch on the sides of the head just below the base of the ears, which is wanting in the female. The horns, hoofs, and naked part of the nose are black.

I am not aware whether the winter specimens of antelopes differ in color or texture of hair from the summer; the summer skins do not vary appreciably among themselves. The markings are fainter in the female, the dusky patch below the ear being generally entirely wanting. The concavity of the ears is whitish, the edges dusky, the back of the ear yellowish brown.

The young of the species in general have the same markings as the adults; the brown of a different shade, however. Even in foetal specimens there are no traces of the light spots of young deer.¹

The geographical distribution of the American antelope is pretty well indicated by the list of specimens given below. According to Dr. Richardson, it is found as far north as the north branch of the Saskatchewan, in latitude 53°. It is spread all over the plains between the Missouri river to the Rocky Mountains, and as far west as the Cascade range of California and Oregon. To the south, it reaches the Rio Grande at its mouth, and probably extends some distance into Mexico, at least throughout the State of Tamaulipas, according to Dr. Berlandier.

¹ The following notice is from Maximilian's Travels:

Antelope americana, Max. Reise, I, 1839, 403.—*Measurements*.—Total length from snout to tip of tail, 4 feet, 10 inches and 8 lines; tail, lifted up from the rump, 7 inches and 3 lines; head, 11 inches and 4 lines; height, anteriorly, from the outstretched hoof to the withers, 2 feet, 6 inches and 10 lines; height, posteriorly, measured the same way, 3 feet and 1 inch; height of the horn, in a straight line, 8 inches and 8 lines. I have seen horns which measured 10 inches. The bucks are frequently without the end or the anterior furcate process of the horns, especially in the young, and in the females, where the horns have generally a length of only from one to two inches, and have the points bent back and a little inwards. The horn of a large buck has been considered as a kind of deer (*Cervus hamatus*) and figured very accurately.

List of specimens.

Catalogue number.	Corresp'g No. of skull.	No. of specimen.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Collected by—
2035	2869	.....	♂	Yellowstone river.....	August, 1856...	Lt. G. K. Warren, U. S. A....	.....	Skin.....	Dr. Hayden.....
2021	.....	14	♂	do.....	July and Aug., 1856.	do.....	.....	Entire skin, and skins of head.	do.....
2034	.....	.....	.....	.....	.....	.....	.....	.....	.....
56	962	.....	♂	Fort Union.....	1850.....	T. Culbertson.....	.....	Hind feet.....	.....
57	963	.....	♂	.....do.....	1850.....	do.....	.....	.....do.....	.....
1832	2877	.....	♂	White Earth river.....	September, 1856	Lt. Warren, U. S. A.....	.....	Skin.....	Dr. Hayden.....
1833	2876	.....	♂	Cannon Ball river.....	October, 1856	do.....	.....	.....do.....	do.....
1835	2875	.....	♂	Grand river.....	do.....	do.....	.....	.....do.....	do.....
1510	.....	.....	♂	Upper Missouri.....	1854.....	Col. A. Vaughan.....	.....	.....do.....	do.....
1511	.....	.....	♂	.....do.....	1854.....	do.....	.....	.....do.....	do.....
1512	2368	4	♂	do.....	1854.....	do.....	.....	.....do.....	do.....
to	to	.....	.....	.....	.....	.....	.....	.....	.....
1515	2371	.....	♂	.....do.....	1854.....	do.....	.....	Head.....	do.....
1516	.....	.....	♂	.....do.....	1854.....	do.....	.....	.....do.....	do.....
1517	.....	.....	♂	.....do.....	1854.....	do.....	.....	.....do.....	do.....
1518	.....	.....	♂	.....do.....	1854.....	do.....	.....	.....do.....	do.....
1892	2590	.....	♂	W. fork Medicine Bow creek.	August 25, 1856	Lt. F. T. Bryan, U. S. A....	304	Skin ¹	do.....
1893	2591	.....	♂	Bridger's Pass.....	August 19, 1856	do.....	282	do. ²	do.....
1708	.....	.....	.....	Llano Estacado, Texas.....	.....	Capt. Pope, U. S. A.....	.....	.....do.....	.....
482	1606	.....	♂	San Francisco mts., N. M....	1853.....	Capt. Whipple, U. S. A.....	.....	.....do.....	{ Dr. Kennerly ... H. Möllhausen...
1077	.....	.....	♂	Presidio del Norte, Texas.....	.....	Maj. W. H. Emory, U. S. A...	.....	Skull.....	J. H. Clark.....
1681	.....	.....	♂	San Elizario.....	.....	.....do.....	.....	.....do.....	do.....
1912	.....	.....	♂	Fort M'Kavet, Texas.....	.....	Dr. Anderson, U. S. A.....	.....	Skeleton.....	.....
2471	.....	.....	♂	Fort Chadbourne, Texas.....	.....	Dr. E. Swift, U. S. A.....	.....	Skull.....	.....
1396	.....	.....	♂	Matamoras, Mexico.....	.....	Lt. Couch, U. S. A.....	.....	.....do.....	Dr. Berlandier...

¹ Measurements before skinning: To occiput, 13.50; to tail, 59.00; tail to end of bone, 6.50; of hairs, 7.00.² Do. do. 13.50 do. 52.00 do. 4.00 do. 6.00.

APLOCERUS, Ham. Smith.

Aplocerus, HAM. SMITH, Griffith's Cuvier, V, 1827, 354.

Haplocerus, WAGNER, Suppl. Schreb. IV, 1844, 462.

Mazama, RAFINESQUE, Am. Month. Mag. I, 1817, 44. (In part only.)

J. E. GRAY, Pr. Zool. Soc. Lond. 1850, 136.

"Horns small, conical, nearly erect, slightly inclined, and recurved at tip; ringed at the base. Nose, ovine, hairy. Muffle, none. Tear bag, none. Fur short; under fur woolly; outer very long, hairy, and dependent. False hoofs present."—GRAY.

The white goat of the Rocky Mountains is, in all its essential features and affinities, a true antelope, having little in common with animals of the type of the domestic goat beyond what belongs to all ruminants of its family. The jet black and polished, slender, conical horns, are much like those of the chamois, which, in fact, connects the genus with the American antelope. The true characters of *Capra* I shall refer to in the next article.

In the quotations at the head of the article, *Mazama* has precedence in point of date, but is utterly inadmissible as a genus of mammals. In the remarks on the genus *Antilocapra*, in the preceding article, the subject is discussed and explained more fully.

APLOCERUS MONTANUS.

Mountain Goat.

Ovis montana, ORD, Guthrie's Geography (2d Am. Ed.) II, 1815, 292, 309.—IB. J. A. N. Sc. I, I, 1817, 8.—IB. Journal de Physique, LXXXV, 1817, 333.

Capra montana, HARLAN, F. Am. 1825, 253.

GODMAN, Am. N. H. II, 325.

SUNDEVALL, Kong. Svensk. Vetens. Handl. for 1844.—IB. Archiv Skand. Beit. II, 1850, 279. (From specimen in Leyden Museum.)

Aplocerus montanus, RICHARDSON, Zool. of Herald; Fossil Mammals, II, 1852, 131; pl. xvi-xix. Osteology. (*Rupicapra americana* on the plate.)

Antilope (Rupicapra) americana, BLAINVILLE, "Nouv. Bull. Soc. Philom. 1816, 73, 80." DESMAREST, Mamm. II, 1822, 478.

Capra americana, RICH. F. Bor. Am. I, 1829, 268; pl. xxii.

OGILBY, Pr. Zool. Soc. IV, 1836, 137.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 120; plate. (From Rich.)

AUD. & BACH. N. Am. Quad. III, 1853, 128; pl. cxxviii.

Mazama americana, GRAY, Knowsley Menagerie, (hoofed quadrupeds,) 1850, 19.—IB. Pr. Zool. Soc. Lond. XVIII, 1850, 136.

Aplocerus americanus, TURNER, Pr. Zool. Soc. Lond. XVIII, 1850, 174.

Mazama sericea and *dorsata*, Raf. Am. Monthly Mag. I, 1817, 44.

Antilope lanigera, HAM. SMITH, Linn. Trans. XIII, 1822, 38; pl. iv.—IB. Griff. Cuv. IV, 1827, 286; plate.

WAGNER, in Schreber Säugt. V, 1836, 1246.

GIEBEL, Säugt. 1855, 303.

Antilope (Aplocerus) lanigera, HAM. SMITH, Griff. Cuv. V, 1827, 354.

Antilope (Haplocerus) lanigera, WAGNER, Suppl. Schreb. IV, 1844, 462.—IB. V, 1855, 460.

Capra columbiana, "DESMOULINS,¹ Dict. Class. III, 580."

FISCHER, Synopsis, 1829, 487.

Rocky Mountain Sheep, JAMESON, "Wernerian Transactions, III, 1821, 306."

Mountain Goat, *Mountain Sheep*, *White Goat*, &c. VULGO.

SP. CH.—Entirely white. Horns, hoofs, and edge of nostrils black. Hair long and pendant. A beard-like tuft of hair on the chin.

¹ I have not been able to verify the date of this reference, which Fischer considers as prior to the other names quoted above. If anterior to 1815, Desmoulins' name will take precedence of that of Ord.

I regret very much not to have it in my power to furnish a satisfactory description of this species, but the only specimens at my command consist of fleeces, without head, legs, or tail. I cannot, therefore, speak with any certainty in reference to such details as the character of the nose, &c. This is said by Sundevall, who examined a specimen in the Leyden Museum, to be like that of *Capra hircus*, or the common goat, which is hairy, except between the nostrils. The same thing, however, is stated of the antelope, which really has a narrow naked strip to the nose, reaching to the edge of the lip.

Judging from the fleeces before me, the size is considerably larger than that of the average of common sheep. The hair is entirely of a yellowish white color, and is composed of a coarse brittle material, with intermediate softer and silky hairs. The hair is very long, and hangs down all over the body, tail, and upper part of the legs, much as in the merino sheep. There is a long goat-like tuft of hairs on the chin.

According to Richardson, "the long coarse hair is abundant on the shoulder, neck, back, and thighs. A considerable tuft of it attached to the chin forms a beard, and there is likewise much of it on the chest and lower part of the throat. Under the hair of the body there is a close coat of fine white wool. The hair on the face and legs is short, and without wool."

The figures and description of the skull and other bones of this species by Dr. Richardson show very clearly that the affinities are much more with the antelopes than the goats or sheep. In fact, none of the more modern systematic writers place it in the genus *Capra*, or, indeed, in the Ovine group. The mere general resemblance externally to a goat is a matter of little consequence; indeed, its body is much more like that of a merino sheep. The soft silky under hairs are very different from those of a goat, as well as the jet black horns, which are without any ridges, and smooth and highly polished at the extremities.

The mountain goat is found in the higher portions of the northern Rocky Mountain and Cascade ranges, at an altitude considerably greater than that of the Bighorn. It is most abundant in the elevated peaks and crests in Washington Territory, and is found as far north as 65° north latitude, according to Richardson. It occurs sparingly near Fort Benton. Owing to the almost inaccessible character of the localities it inhabits, it is very difficult to obtain good specimens, the robes brought by the Indians being always much mutilated.

List of specimens.

Catalogue number.	Locality.	Whence and how obtained.	Original number.	Nature of specimen.
1948	Cascade mountains, near Upper Nisqually...	Dr. George Suckley.....	89	Robe
1474	Cascade mountains, north of Mt. Rainier...	Lieut. Nugen, U. S. A.		do.....
1475	do.....do.....	do.....		do.....
1476	do.....do.....	do.....		do.....

OVIS, Linn.

Ovis, LINNÆUS, "Systema Naturae, 1735."

Horns curving so much backwards that the tip is brought forwards again. Tear bag generally present, sometimes very small. Nose convex; chin without a beard; nose entirely hairy, except between the nostrils; a secreting gland between the hoofs.

The above diagnosis will serve to distinguish the sheep proper from the goats. According to Sundevall and Keyserling & Blasius the lachrymal sinus (tear bag of Gray) is small. The tail is very short, except in the domestic species. Horns, trigonal, the greatest diameter of their cross section at the base transverse to the axis of the skull; they bend round, so as to form part of a circle, or more than one being sometimes twisted spirally; the diameter of the curve, however, less than the length of the head.

In *Capra*, on the other hand, the forehead is much arched. The lachrymal sinus and glands between the hoofs are wanting. The chin is bearded. The hoofs not less high on the inner side than on the outer. Horns present in both sexes. The horns are compressed, with a sharp edge before and behind, strongly angular, curving backwards, the greatest diameter of their cross section nearly parallel with the axis of the head; the horns do not nearly complete a circle, nor do the tips ever come forwards; their curve forms part of a circle, whose diameter is much longer than the head.

In both sheep and goats the horns are generally of a dull yellowish brown color, very different from the polished black of the antelopes.

OVIS MONTANA, Cuv.

Mountain Sheep; Bighorn.

Ovis ammon, MITCHILL, Medical Repos. X, 1807, 35.

ORD, in Guthrie's Geog. (2d Am. Ed.) II, 1815, 292, 308.

HARLAN, F. Amer. 1825, 164. (Desc. from specimen of Lewis and Clark.)

GODMAN, Am. N. H. II, 328.

Ovis montana, CUVIER, R. An. I, 1817, 267.

ORD, Jour. de Physique, LXXXVII, 1818, 151.

DESMAREST, Mamm. II, 1822, 437.

RICHARDSON, F. Bor. Am. I, 1829, 271; pl. xxiii.—IB. Zoology of the Herald, Fossil Mammals, I, 1852, 87; pl. i. (skeleton.)

DOUGHTY'S Cab. N. H. I, 1830, 193; pl. xvii, (from specimen of Lewis and Clark.)

WAGNER, Schreber's Säugt. V, 1836, 1367; pl. cclxiv, D*.

PRINCE MAX. Reise Nord-America, I, 1839, 549.

BLYTH, Ann. N. H. VII, 1841, 197, 259.

GRAY, Knowsley Menagerie, 1850, 37.

AUD. & BACH. N. Am. Quad. II, 1851, 163; pl. lxxiii.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 123, fig. plate.—IB. Stansbury's Exped Great Salt Lake, 1852, 312.

GIEBEL, Zool. Säugt. 1855, 282.

Capra montana, FISCHER, Synopsis, 1829, 488.

Agoceros (Ovis) montana, WAGNER, Suppl. Schreber Säugt. IV, 1844, 505.—IB. V, 468.

Ovis pygargus, HAM. SMITH, Griff. Cuv. IV, 1827, 318; plate.—IB. V, 1827, 359.

Ovis californianus, DOUGLASS, Zool. Journal, IV, 1829, 332.

Ovis californiana, BLYTH, Pr. Zool. Soc. Lond. VIII, June, 1840, 65.—IB. Ann. Nat. Hist. VII, 1841, 199, 260.

Ovis californica, WAGNER, Schreber's Säugthiere, V, 1836, 1371.

??? *Ovis nivicola*, EHSCHOLTZ, Zool. Atlas, I, 1829, 1; tab i.

BLYTH, Ann. Nat. Hist. VII, 1841, 197.

Ovis cervina, DESMAREST, Nouv. Dict. XXI, 1818, 553.

Mountain Ram, MCGILLIVRAY, N. Y. Med. Rep. VI, 1803, 237; plate. (Shot on side of R. Mts. between Missouri and Saskatchewan.)

Belier de montagne, GEOFFR. Ann. du Mus. II, 1803, 360; pl. lx. (McGillivray's specimen.)

Tayé, a species of sheep, BARTON's Med. and Physical Journal, II, 1806, 106. (Refers to *Bighorn*, 1, 1805, 75.)

SP. CH. Much larger than the domestic sheep. Horns, in the male very large, curving round, but not completing a full circle, and with but little of a spiral twist, compared with other species. The tips of the horns not more than twenty inches apart. General color grayish brown, paler about the head; a light patch under the lower jaw. Legs like the body, with a narrow line of white on their posterior edges. Buttocks, for some inches anterior to the tail, and belly white. Tail like the back.

Female with smaller horns, more like those of the goat.

In this species the muzzle is short but rather acute. The nostrils are much as described in the antelope, except that in most specimens there is no appreciable strip of naked skin extending from the septum to the edge of the upper lip. In one skin a narrow black line of naked skin is barely appreciable; in the others nothing of the kind is apparent. The nostrils

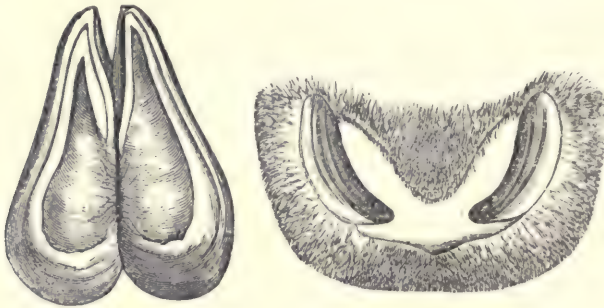


Fig. 24. *Ovis montana*, Male. End of muzzle, as viewed from above, and in front. (Taken from the mounted specimen brought by Captain Stansbury.)

Fig. 25. Under surface of left front hoof.

are elongated, nearly horizontal, about a quarter of an inch apart anteriorly, and diverging behind. Their upper border is naked, the lower hairy. In a very young specimen there is a short growth of short hair over the entire border of the nostrils.

The ears are moderately long; shorter and much more rounded at the apex than in the antelope.

In a young specimen there is an apparent indication of a larmier anterior to the orbit, although overgrown with hair. I notice nothing of the kind in the skull.

The under surfaces of the hoofs are shaped much as in the antelopes; very long, narrow, triangular, acutely pointed anteriorly, with the sides nearly straight, and convex behind; viewed laterally, their posterior outline is one and a half times the superior. The anterior hoofs are the longest. Both feet are provided with the second pair of small hoofs, above the first.

The tail is very short, with the hairs only two or three inches long, in the female. It is covered with hair, rather depressed and somewhat pointed.

The general color of this animal is a grayish brown, watered in some parts with darker, or perhaps ashy plumbeous brown would express the tint more nearly. The skins before me do not permit any very critical account of the variations in shade in different parts of the body, except that the tints about the head are a little paler, and of a dirty white about the muzzle and chin. According to Mr. Audubon there is a darker vertebral line along the back to the rump. The entire neck, and a little beyond the fore legs is as described, with a darker plumbeous tinge posteriorly, and a whitish patch between the rami of the lower jaw. The legs all round are of the ground color, a narrow line on the posterior face only being white. The belly, inguinal region, and on a patch on the rump, beginning some six inches anterior to the tail, and extending backwards to the posterior outline of the buttocks, (which it intersects about as far below the tail as it commences anteriorly to it,) are white. The tail itself is colored like the back, connected with it by a narrow line of the same color. The hoofs are black; the horns yellowish brown, as in the common sheep.

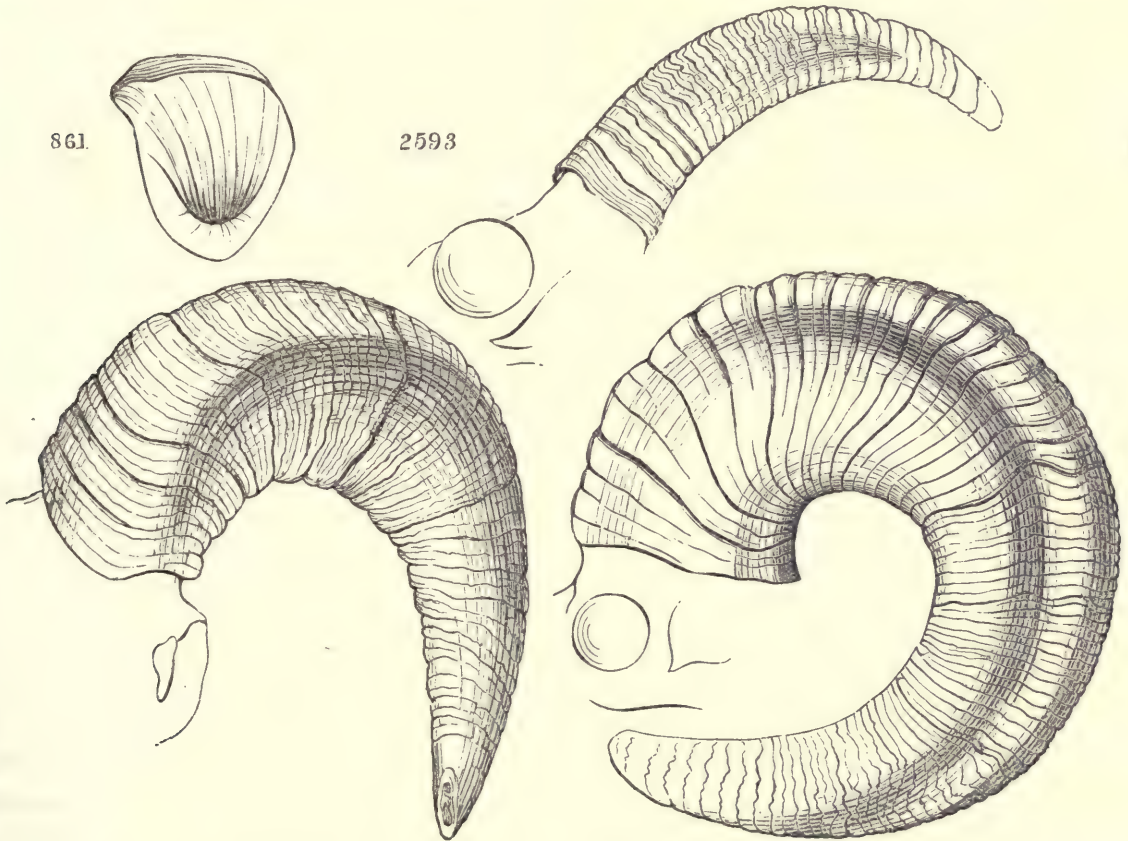


Fig. 26. *Ovis Montana*.—Male. Upper Missouri. Left horn from the left side.

Fig. 27. The same from the front.

Fig. 28. Base of the horn. Scale: 4 inches to the inch.

Fig. 29. *Ovis Montana*.—Female, No. 2593. Bridger's Pass. Left horn from the left side. Size, 3.42 inches to the inch.

The hair of this species is very coarse and spongy in the summer, coarser than in the deer, rather finer than that of the antelope, which it resembles in crimping, sponginess, brittleness, and coarse thread-like appearance. In summer there appears to be no under coat, but in winter there is probably more or less of it, as in an autumn specimen there is a considerable amount of a rather fine wool, of short staple, but probably never in sufficient amount to be of any value.

According to Mr. Audubon, a large bighorn will weigh about 350 pounds, perhaps more. It is larger than a Virginia deer, much more so than the domestic sheep.

The horns are of immense size, and provided with transverse ridges or constrictions. They arise above the eyes, the middle of their root being about opposite the posterior border of the orbit. The inner bases of the horns are almost in contact, separated only by the space of half an inch. They rise for a short distance, then curve gently backwards, diverging throughout their course until they have described rather more than a semi-circle. Their section is rather triangular throughout, becoming much compressed towards the apex, which is twisted outward. Their curve is such that, with the base of the skull in a horizontal plane, the truncated tip comes back to about the vertical plane of the occiput, its upper edge about one and a half inches below the horizontal plane. In one old animal the horns are 19 inches apart at the tip; they measure $15\frac{1}{2}$ inches in circumference at the base, and 28 inches in length around the curve. They weigh $18\frac{1}{2}$ pounds with the perfectly clean skull, lacking the end of the nose and the lower jaw. In the specimen brought by Captain Stansbury from the Rocky Mountains, however, the horns are 18 inches in circumference at the base; the horn along the convexity measures $36\frac{1}{2}$ inches, and the tips are 18 inches apart.

The section of these horns at the base is sub-triangular, the outer and upper sides of the triangle nearly straight, the inner convex. Thus there are two planes to the outline of the horn, and one curved surface. The exterior face of the horn is quite plane, the application of a straight edge showing it to be only slightly convex. In no one of many horns have I seen anything like the very decided valley (or notch in cross section) exhibited in Middendorff's figure of his supposed *O. montana*, from the Sea of Okotsk. The upper face of the horn is likewise only gently convex, the two planes meeting at less than a right angle. The remaining face of the horn, or that constituting the internal and posterior surface, is convex. Generally the transverse diameter of the horn at its base is as long, a little longer, or but little shorter than the antero-posterior.

In a bighorn from California, on the 35th parallel, fig. 30, the horns are less massive, measuring only thirteen inches in circumference at the base, and two feet along the external upper ridge, along the convexity of the curve. The plane character of the exterior and superior faces, is very decided; as is also their triangular section, the base of the triangle (anterior) being less than the straight side. The horns are very much compressed towards the end, and terminate in a rounded tip. These tips are $19\frac{1}{4}$ inches apart, and distant eleven inches in a straight line from the anterior base of the horn; the ordinate of the arc, of which the straight line is the chord, measures $8\frac{1}{2}$ inches from the convexity of the horn. The orbits are appreciably larger.

In the female the horns are much smaller, and more like those of a male goat not fully grown. They are compressed laterally, the sides curved, and more flattened to the tip. They

rise gently from the head, and curve a little backward and outward. They measure six or seven inches along the curve.

The divergence of the axes of the horns of the bighorn at the base is at an angle of about 67 degrees.

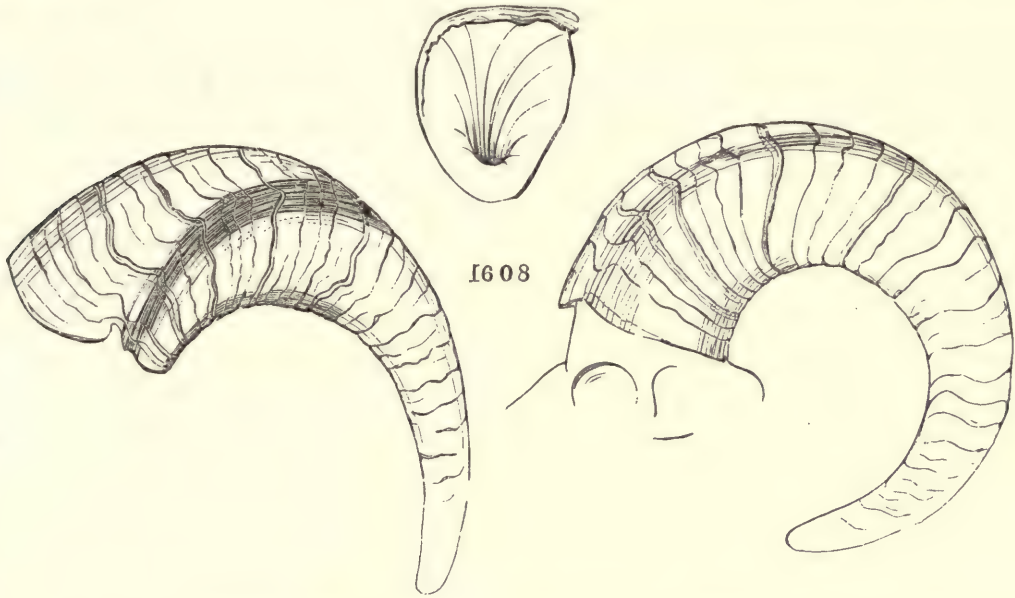


Fig. 30. *Ovis montana*, male, 1608. San Francisco Mountains, New Mexico. Left horn from left side.

Fig. 31. Left horn from in front.

Fig. 32. Base of the horn.

Size, 5.61 inches to the inch.

I have already referred to the figure, by Middendorff, of a supposed horn of *O. montana*, from the Sea of Okotsk. This differs appreciably from any I have seen, in being quadrilateral rather than triangular, thicker behind than before, and with a groove or furrow in the external plane. There is an abrupt bend upwards of the tip of the horn, which I have never observed in American specimens. In these, the exterior surface of the horn is only gently twisted, the basal half remaining in almost a true plane. The principal part of the twist is at about the middle of the horn, or at the base of the terminal third; after which, there is again very little twist to the end. To bring back the outer surface of the horn to one plane, would only require the point to describe an arc of about six inches. In the Upper Missouri horns, the curve of the upper outline of the horn, viewed perpendicular to its plane, forms an apparently nearly true segment of a circle, (about three-fourths). In the California horns, this curve is more cycloidal.

I have never had an opportunity of examining the Siberian argali, (*Ovis argali*, of Pallas,) supposed to be very similar to our species, and by some authors quoted as identical, nor have I found anywhere any satisfactory comparison of the two. Judging, however, from the very minute description of the argali, in Pallas' *Naturgeschichte merkwürdiger Thiere*, Samml. xi, 1779, p. 1, tab. i, ii, it would appear to be rather smaller than the big horn, weighing but 310 pounds (to 350); the total length, 5 feet 10 inches. The greatest apparent difference is in

the horns. These, in the argali, appear to be more widely divergent at the base. The horns, too, in the old animal, after coming forwards after their curve backwards, have the ends curving gently upwards and then bent quite abruptly outwards, so that the distance between the tips of the horns measured across the forehead is about 32 inches, (possibly 26 in a straight line). The length of the horn around the curve is about 47 inches. In the bighorn there is only a slight outward twist of the horn, the tips of which are not distant more than 18 inches, (or 20 in the California variety,) while, though the larger animal, the horn measures only 36½ inches. These peculiarities will be readily appreciated in comparing the wood cuts given above with Pallas' figure.

While considering the bighorn as distinct from the argali, I am far from considering it the same with the Kamtschatkan *Ovis nivicola* of Eschscholtz, as asserted by most authors. It is with the argali that the latter is to be compared, both having the same peculiarity of an excessive twist outwards and upwards of the ends of the horns, which also curve over a greater number of degrees. Judging from the figure of Eschscholtz, the tips of the horns must be at least three feet apart, instead of the 20 inches of our species. All these peculiarities are those of the argali; and without pretending to decide whether the Kamtschatkan and Siberian species are the same, I will only state that they are so considered by Pallas, who gives the measurement, description, and figure of a young ram from Kamtschatka in the article quoted above. The same remarks will apply, in great measure, to the supposed horn of *O. montana*, figured and described by Middendorff, as referred to above. I am far from admitting that any of our North American mammals occur in eastern Asia, unless it be *Spermophilus parryi*, although some authors have attempted to prove an identity for the beaver, the brown bear, the sable, the large marmot, as well as the large sheep.

Excluding Asia from the area occupied by the bighorn, as I think we have abundant reason to do, its range extends from the region of the Upper Missouri and Yellowstone to the Rocky Mountains, and the high grounds adjacent to them on the eastern slope, as far south as the Rio Grande. They are not found to any considerable distance east of the Black Hills, however, although said to be abundant in the Mauvaises Terres. Westward, they extend as far as the Cascade and Coast ranges of Washington, Oregon, and California, and follow the high lands of the mountains some distance into Mexico.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Original number.	Nature of specimen.	Collected by—
.....	71	973	Fort Union, Neb. ....	.....	General Land Office....	.....	Mounted	Dr. J. Evans.....
55	.....	.....	.....do.....	.....	.....do.....	.....	Head.....	do.....
1842	.....	.....	Yellowstone.....	Aug. 18, 1856	T. Culbertson.....	.....	do.....	do.....
2036	2871	.....	.....do.....	do.....	Lt. G. K. Warren, U. S. A.....	.....	Skin	Dr. F. V. Hayden...
1519	.....	.....	Upper Missouri.....	1854.....	do.....	.....	do.....	do.....
1520	.....	.....	.....do.....	1854.....	Col. A. Vaughan.....	.....	do.....	do.....
1521	.....	.....	.....do.....	1854.....	do.....	.....	Head.....	do.....
1522	.....	.....	.....do.....	1854.....	do.....	.....	do.....	do.....
1523	.....	.....	.....do.....	1854.....	do.....	.....	do.....	do.....
.....	.....	.....	Fort Laramie.....	.....	Capt. S. Van Vliet, U. S. A.....	.....	Skin	do.....
.....	861	.....	.....do.....	.....	Maj. J. H. Carleton, U. S. A.....	.....	Skull.....	do.....
.....	883	.....	.....do.....	.....	.....do.....	.....	Horns	do.....
1895 ¹	2593	.....	Medicine Bow creek, Neb.....	Aug. 30, 1856	Lt. F. T. Bryan, U. S. A.....	313	Skin	W. S. Wood.....
1894*	2592	.....	Bridger's Pass	Aug. 19, 1855	do.....	283	do.....	do.....
.....	1062	.....	Xemez, N. M., west of R. Grande .....	.....	Dr. Edwards, U. S. A.....	.....	Horns	do.....
.....	1608	.....	San Francisco mountains, N. M. ....	.....	Capt. Whipple, U. S. A.....	.....	Skull.....	Dr. Kennerly and H.
.....	1609	.....	.....do.....	.....	.....do.....	.....	Horns	B. Mollhausen....

¹ Measurement before skinning: to occiput, 15½ inches; to tail, 66; tail vertebrae, 3; with hair, 4 inches.

* Measurement before skinning: 15 inches to occiput; to root of tail, 64; tail to end of vertebrae, 5—of hairs, 6 inches.

OVIPOS, Blainville.

Ovibos, BLAINVILLE, "Bull. Soc. Philom. 1816."

AUD. & BACH. N. Am. Quad. III, 1853, 46.

Hoofs broad, inflexed at the tips. Tail very short. No naked muffle, except a small space between the nostrils, which is not furrowed. Horns very broad and much approximated at the base, bending rapidly downwards. Hair very long and pendent.

The musk ox is one of the most interesting of American animals, and at the same time one of which, on account of its geographical distribution, is very little known. In the hairy muffle, long, straight, pendent and soft hair, and short tail, with other features, it bears a strong resemblance to the sheep and goats, and in a strictly natural arrangement will be placed quite near to them. But one living species is known, although several fossil ones are indicated by authors.

OVIPOS MOSCHATUS.

Musk Ox.

Bos moschatus, ZIMMERMANN, Geog. Geschichte, II, 1780, 86.

GMELIN, Syst. Nat. I, 1788, 205.

GODMAN, Am. N. H. III, 29.

WAGNER, Schreber's Säugt. V, II, 1838, 1706; pl. ccii A, ccii B.

Bos (Ovibos) moschatus, WAGNER, Suppl. Schreber, IV, 1844, 512.--IB. V, 1855, 471.*Ovibos moschatus*, "BLAINVILLE, Bull. Soc. Phil. 1816."

DESMAREST, Mamm. II, 1822, 492.

HARLAN, F. Am. 1825, 265.

RICHARDSON, F. B. Am. I, 1829, 275.—IB. Zoology of Herald, Fossil Mammals, I, 1852, 66; II, 119; pl. ii, v, xi, xii, (osteology.)

OGILEY, Pr. Zool. Soc. Lond. IV, 1836, 137.

AUD. & BACH. N. Am. Quad. III, 1853, 46; pl. cxi.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 121; plate.

Musk bison, FENNANT, Hist. Quad. 1781, No. 9.—IB. Arctic Zool. I, 1784, 8.

Sp. Ch.—"Adult male, size of a two year old cow. Horns united on the summit of the head, flat, broad, bent down against the cheeks, with the points turned up. Color brownish black."—Aud. & Bach.

Without any specimen at hand of this species, I refer to the authors quoted above for a description of its habits and peculiarities. As already stated, some of its characters approach that of the Ovine group, especially the end of the snout, which is hairy, with only a small naked space between the nostrils. I have given a rude diagram of this feature, as hastily sketched from the mounted animal in the museum of the Philadelphia Academy of Natural Sciences.

The musk ox is very rare in collections, the only one in the United States being that in the Philadelphia Academy, presented by Dr. Kane, who received it from the arctic seas.

This animal, as a living species, is confined to the barren grounds of arctic America, beyond 60°, extending northward as far as land is found. It is said to occur fossil at Eschscholtz bay,



Fig. 33. *Ovis moschatus*. End of muzzle, from above and in front. (The figure is a mere diagram.)

on the northwest coast; and a fossil skull has recently been brought to light in a railroad cutting in England. Some fossil remains of oxen, found in various parts of the United States, approximate in many respects to the musk ox, and have received from Dr. Leidy the generic name of *Bootherium*.

BOS, Linnæus.

Bos, "LINNÆUS, Syst. Nat. 1735."*Bison*, AUD. & BACH. N. Am. Quad. II, 1851, 32.

End of muzzle very broad, entirely naked. A wide interval between the nostrils. Hoofs very broad. The two together, wider than long. Ears large, oval. Horns arched, at the base directed outward. Tail rather long.

The wild oxen constitute, in the main, a very natural group, although some forms are quite aberrant. The genus *Bos*, however, is easily distinguished by the above characters. There are several distinct groups in the genus, which may be called the oxen, the buffaloes, and the bisons, typified by the domestic bull, the Asiatic buffalo, and the American buffalo, and very appreciably characterized by Sundevall¹ and other authors. Much information respecting the osteological characters of the genus will be found in Sir John Richardson's Report on the Fossil Mammals of the Herald, and in Dr. Leidy's paper on the Fossil American Oxen, in Smithsonian Contributions to Knowledge.

The American buffalo belongs to the sub-genus *Bison* or *Bonassus* of authors.

BOS AMERICANUS, Gmelin.

American Buffalo.

Bos americanus, Gmelin, Syst. Nat. I, 1788, 204.

Desmarest, Mammal. II, 1822, 496.

Harlan, F. Am. 1825, 268.

Godman, Am. N. H. III, 4.

Richardson, F. Bor. Am. I, 1829, 279.

Doughty, Cab. N. H. II, 1832, 169; pl. xlv.

Wagner, Schreber, Säugt. V, II, 1838, 1513; pl. ccxvi, ccxvi A.

Giebel, Säugt. 1855, 271.

Bos (Bonassus) americanus, Wagner, Suppl. Schreb. IV, 1844, 516.—In. V, 1855, 472.*Bison americanus*, Smith, Griff. Cuv. V, 1827, 374.

Turner, Pr. Zool. Soc. Lond. XVIII, 1850, 174.

Sundevall, Kong. Sv. Vet. Akad. Handl. for 1844.—In. Archiv. Skand. Beit. II, 1850, 154.

Aud. & Bach. N. Am. Quad. II, 1851, 32; pl. lvi, lvii.

Baird, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 124, plate.

Bison, Pennant, Hist. Quad. 1781, No. 19.—In. Arctic Zool. I, 1784, 1.*Bison d'Amérique*, St. Hilaire et Cuv. Hist. des Mammif. IV, 1819; plates of male and female." *Taurus mexicanus*, Hernandez."

For a satisfactory account of the external form of this, the largest of the American quadrupeds, I must refer to the excellent description by Mr. Audubon in the Quadrupeds of North America. Dried and distorted skins give but a faint idea of the shape or even size of this monarch of the American prairies. The elevated hump between the shoulders, the broad full chest, the narrow loins, and the slender legs, can only be fully realized in the living animal, or from the descriptions of those who have had an opportunity of seeing it alive.

The naked muffle is somewhat as in the deer, extending from the broad septum to the edge of the lip anteriorly, and widening below until the naked edge of the lip is about twice as wide as the space between the nostrils. The naked skin of the muffle extends on the upper outline,

¹ Kong. Sv. Vet. Ak. Handl. for 1844, 1846, and in Archiv Skand. Beit. II, 1850, 151-154.

along the upper side of the nostrils, which are thus entirely naked, even within the cavity; the under side of the nostrils is, however, densely hairy. In the deer the naked skin does not extend so far along the nostril.

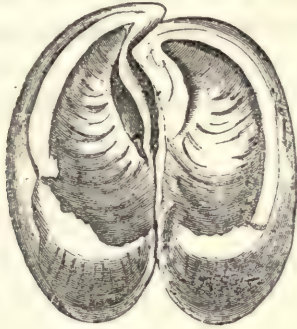


Fig. 34. *Bos americanus*. End of muzzle from above and in front.

Fig. 35. Under surface of left front hoof of the same.

The line of hair on the end of the muzzle forms a gentle curve, convex anteriorly. There is no indication of a larmier.

The hoofs are broad and short, their basal outline a broad ellipse, the sides much rounded; their posterior outline, as viewed from the side, is generally considerably longer than the superior.

The tail is rather short; in summer it is very slender at the base, with very short hairs, and appearing almost naked; at the tip, however, is a tuft of very long hairs, nearly or quite as long as the vertebral portion.

The horns are very thick at the base, but short, and tapering rapidly to a sharp pointed tip; their axes at first are nearly in the plane of the forehead, they, however, almost immediately, slope slightly upwards until, at half their length, they bend abruptly upwards, at nearly a right angle; the axis of the terminal pointed portion is curved a little backwards, rendering the anterior outline of the horn somewhat convex.

In the old male the entire head is thickly covered with a dense growth of long shaggy hair, which constitutes on the lower surface of the chin a long pointed beard. These hairs, on the side of the neck behind the horns, measure as much as eighteen inches, those of the beard about nine. The shoulders and fore legs as far as the knees are also covered with similar shaggy hair. The anterior half of the back and sides is covered with a shaggy coat of woolly hair; the hairs on the posterior portion abruptly much shorter; in summer specimens the hinder part of the body and the hind legs appear almost naked.

The hoofs, muffle and horns of the buffalo are entirely black. The hair, too, is generally of a sooty black, except the middle of the back, which is of a brownish color.

In the skin of a young calf the color is throughout of a chestnut brown, with large patches of white on the belly. This is probably an unusual color, as it was considered "medicine" by the Indians.

For further details as to size, weight, and other points connected with the American buffalo, I must refer to the article of Audubon and Bachman.

The buffalo of America is very closely related to the European bison, (*Bos urus*), the Auerochs of the Germans, and the Bonassus of the ancients. I am unable to state satisfactorily in what

the differences consist ; in fact, some authors, at this late date, attempt to prove that the two species are mere varieties of each other.¹

The American buffalo was formerly found throughout the entire eastern portion of the United States to the Atlantic ocean, and as far south as Florida. In the Hudson Bay country it did not pass east of the latitude of Red river ; to the south it extended over the entire Mississippi valley, through Texas and into Mexico.

At the present time its range is very different. The progress of civilization has crowded it off towards the west, until now it is never seen east of the Missouri, except in its northern portion. To the north, it is found in Minnesota and on Red river. The main range is, however, between the Upper Missouri and the Rocky Mountains, from Great Martin lake, latitude 64°, and the Saskatchewan, to northern Texas and New Mexico. In western Texas it is very seldom seen, nor do I know whether it is now found in Mexico at all. Of late years only, it has found its way through the Rocky Mountains to the upper plains of the Columbia.

List of specimens.

Catalogue number.	Corresponding No. of skull.	Sex and age.	Locality.	When collected.	Whence and how obtained.	Nature of specimen.
84	-----	-----	Fort Union -----	-----	Ed. T. Denig and A. Culbertson ..	Head -----
2009	2843	♂	Yellowstone -----	August, 1856	Lieutenant G. K. Warren -----	Skin -----
2007	2841	♀	do -----	do -----	do -----	do -----
2008	2842	♂	do -----	do -----	do -----	do -----
2010	2844	♂	do -----	do -----	do -----	Skin (four months.)
2006	2840	♂	White Earth River -----	Sept. 8, 1856	do -----	Skin -----
2011	2845	♂	Fort Berthold -----	July 8, 1856	do -----	Head -----
2012	2846	♀	do -----	do -----	do -----	do -----
1829	-----	o	Fort Pierre -----	-----	Mr Atkinson -----	Spotted skin -----

¹ Jäger, Wütemburgische naturwissenschaftliche Jahreshäfte, III, 176-203.

APPENDIX A.

LIST OF AUTHORITIES REFERRED TO IN THE PRECEDING REPORT.

In the present Appendix I have endeavored to furnish as complete an account as possible of the articles and works quoted in the preceding pages. They have nearly all been examined by myself, with reference to the present report; and the few titles which have not fallen under my observation, but have been borrowed from other authors, will be found placed between quotation marks. Whenever these marks do not occur, either here or in the synonymy of the report itself, the references are to be understood as having been personally verified.

All the works referred to without quotation marks are to be found in the library of the Smithsonian Institution, unless some other depository be assigned, such as the library of the Philadelphia Academy of Natural Sciences, and a few others. In many cases, where the works previously consulted were not at hand when preparing this list, abstracts only, either of the volumes or of their contents, have been given, instead of the full title of each separate article, unless these were to be found in the *Nomenclator Zoologicus* and *Bibliographia Zoologiae* of Professor Agassiz, or in the *Bibliotheca Historico-Naturalis* of Engelmann. Of these important bibliographical aids I have made free use throughout, although I have copied the titles, as far as I could conveniently, from the works themselves. The titles given between quotation marks have, however, in nearly all cases, been taken from the volumes just mentioned.

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Exploration and survey of the valley of the Great Salt Lake of Utah, including a reconnaissance of a new route through the Rocky Mountains. By HOWARD STANSBURY, Capt. Corps Topographical Engineers. Printed by order of the Senate of the United States. Philadelphia: Lippincott, Grambo & Co., 1852. (An edition of the same work was subsequently printed by the Public Printer for the House of Representatives, in 1853. This is much inferior in typography and illustrations.)

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WOODHOUSE.—On *Canis frustror*.—See PHILADA., Acad. Nat. Sciences: Journal.

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ZIMMERMANN, Geog. Gesch.—Geographische Geschichte der Menschen und der vierfüssiger Thiere. Von C. A. W. ZIMMERMANN. 8vo. I, 1778; II, 1780; III, 1783. (Lib. of Phila. Acad.)

Zoology of Beagle, Blossom, Favorite, Herald, Sulphur, Venus —See these names.

Zoology of Beechey's Voyage.—See BLOSSOM.

APPENDIX B.

ALPHABETICAL LIST OF LOCALITIES REFERRED TO IN THE PRECEDING REPORT.

The following list is intended to explain more fully than could conveniently be done in the body of the report, the geographical position and character of the various localities at or near which the specimens enumerated were collected. The notices are, however, to be considered as only approximately accurate, as they have been compiled very hastily, and without the opportunity of consulting any one on the subject. Very few latitudes and longitudes are given exactly, with the exception of a few belonging to the military posts, as the object has been, not to furnish an accurate table of geographical positions, but merely such an approximation thereto as might aid in giving a general idea of the distribution of the species of North American mammals.

The principal works used in preparing the account of the localities given are as follows:

Reports of Explorations and Surveys to ascertain the most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean. Made under the direction of the Secretary of War, in 1853-'54. Vol. I. 4to. Washington, 1855.

Statistical Report of the Sickness and Mortality of the Army of the United States, from Records in the Surgeon General's Office. Prepared under the direction of Brevet Brigadier General Thomas Lawson, Surgeon General U. S. A., by Dr. Richard H. Coolidge, U. S. A., Washington. 4to. 1856.

Explorations of the Dakota Country, in the year 1855. By Lieut. G. K. Warren, U. S. A., Topographical Engineer of the Sioux Expedition. 8vo. Washington, 1856.

Report of the Superintendent of the United States Coast Survey, for the year 1855. 4to.

A New and Complete Gazetteer of the United States. Compiled by Messrs. Baldwin and Thomas. 8vo. Philadelphia, Lippincott, Grambo & Co. 1854.

Map of the United States and their Territories between the Mississippi and the Pacific Ocean, and of part of Mexico. Compiled in the Bureau of the Corps of Topographical Engineers. Washington, 1850.

Map of the Territory of the United States from the Mississippi to the Pacific Ocean. Ordered by the Hon. Jefferson Davis, Secretary of War, to accompany the Reports of the Explorations for a Railroad Route, &c. Compiled from authorized explorations and other reliable data, by Lieut. G. K. Warren, Topographical Engineer, in the office of Pacific Railroad Survey, War Department, under the direction of Brevet Major W. H. Emory, Topographical Engineers, in 1854, and of Captain A. A. Humphreys, Topographical Engineers, in 1854-'7. (Not yet completed and published.)

Map of Routes for a Pacific Railroad. Compiled to accompany the report of the Hon. Jefferson Davis, Secretary of War, in office of Pacific Railroad Survey. 1855. (Revised January, 1857, by G. K. Warren, Lieut. Topographical Engineers.)

A New Universal Atlas of the World, (Mitchell.) Folio. 1857.

Britton & Reys' Map of the State of California. Compiled, &c., by George H. Goddard, C. E. San Francisco. 1857.

ALPHABETICAL LIST OF LOCALITIES.

	Latitude.	Longitude.
	° ' "	° ' "
ABBEVILLE, S. C.—In Abbeville district, near the southwestern border of South Carolina		
ADIRONDAC MOUNTAINS, N. Y.—A range of mountains in the northern part of New York and about 50 miles west of Lake Champlain		
ALTON, ILL.—On the Mississippi river, about 20 miles north of St. Louis		
ALVARADO RIVER, MEX.—South of Vera Cruz, near the Pacific coast. About	18 43	95 43
AMERICAN RIVER, CAL.—Middle fork, separating Placer and El Dorado counties. Mouth about.....	38 52	121 08
ANN ARBOR, MICH.—About 20 miles west of Detroit.....		
ANTELOPE HILLS, ARK.—South side of Canadian river. About	100 00	35 48
ARIKAMTCHITCHI ISLAND.—An island in Behring's Straits off the extreme northeastern corner of Asia.....		
ASTORIA, O. T.—At mouth of Columbia river, on south side. (Coast Survey report).....	46 11	123 47
AUGUSTA, GA.—On the northeastern border of the State.....		
AUSTIN, TEX.—Capital of the State. About	30 22	98 10
BENT'S FORT, ARK.—North side of Arkansas river. Near.....	38 00	103 00
BIGHORN RIVER, NEB.—A tributary of the Yellowstone, from the south, running nearly north and south. Mouth about.....	46 30	107 10
BIG SIOUX RIVER.—Tributary of the Missouri from the east, running north and south. Sioux City is situated at its mouth, the altitude of which, according to Lieut. Warren, is 1,250 feet; its latitude and longitude.....	42 32	96 26
BIJOU CREEK.		
BIJOU HILL, NEB.—East of the Missouri. About	43 30	99 20
BILL WILLIAMS' FORK, NEW MEX.—Tributary of the Colorado from the east. Mouth about	34 20	114 00
BLACK HILLS, NEB.—An offshoot of the Rocky Mountains on their eastern side. Its northern extremity is between 200 and 300 miles west of the Missouri river. The southern extremity is west of Fort Laramie		
BLOOMINGTON, ILL.—Seat of McLean county, near the centre of the State.....		
BLOUNT COUNTY, TENN.—In the southeast portion of Tennessee bordering on North Carolina.....		
BLUE MOUNTAINS, O. T.—About 200 miles east of and nearly parallel with the Coast Range, extending from about 46° north latitude towards the southeast		
BODEGA, CAL.—On the coast of California, north of San Francisco. About	38 30	
BOIS DE SIOUX, MIN. TER.—Near the head of Red river of the north. Mouth near.....	46 20	96 20
BOISE RIVER, O. T.—Tributary of Lewis' fork of the Columbia river, on the west side. Mouth near...	44 00	116 30
BONE CAVE, CARLISLE.—On the south bank of the Conedoguinet creek, one mile north of Carlisle, the county town of Cumberland county, Pennsylvania. In the limestone rock.....		
BOSTON, MASS.—About	42 20	71 00

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
BRADFORD COUNTY, PA.—In the north-northeastern part of the State, bordering on the New York line. The Alleghany mountains run through it.....		
BRAZOS SANTIAGO, TEX.—On the Gulf of Mexico, near Point Isabel, about 35 miles east of Brownsville.....		
BRAZOS RIVER, TEX.—In eastern portion of Texas. Mouth about 40 miles southwest of Galveston.....		
BRIDGER'S PASS, NEB.—Rocky Mountains, southwest of Fort Laramie. About.....	41 30	107 30
BROWNSVILLE, TEX.—On the north side of Rio Grande, about 35 miles from the Gulf of Mexico, directly opposite Matamoras. Near.....	26 00	97 40
BURLINGTON, IOWA.—On Mississippi river. Near.....	41 00	91 00
BURLINGTON, VT.—Northern part of Vermont, on east side of Lake Champlain.....		
CACHE LE POUDRE CREEK, NEB.—On Lieutenant Bryan's line of 1856. Locality not ascertained.....		
CADEREITA, NEW LEON, MEX.—A town of the province of New Leon, northern Mexico, a few miles east of Monterey, Mexico. About.....	25 30	100 00
CAIRO, ILL.—A town at the junction of the Ohio and Mississippi rivers. About.....	37 00	89 00
CALAVERAS CO., CAL.—A county a little north of the central portion of California, and east of San Francisco.....		
CALCASIEU, LA.—On the Gulf of Mexico, near the western border of Louisiana.....		
CANNON BALL RIVER, NEB.—A tributary of the Upper Missouri river, on the west side. Mouth near.....	46 30	100 00
CANOE CREEK, CAL.—A tributary of the Sacramento, on the east side of the Sierra Nevada range. Mouth about.....	41 00	121 00
CAPE FLATTERY, W. T.—The extreme northwestern point of Washington Territory, on the Straits of De Fuca. About.....	48 30	124 40
CAPON SPRINGS, VA.—A village in Hampshire county.....		
CARLISLE, PA.—County town of Cumberland county, Pennsylvania. According to "Army Medical Statistics," about.....	40 12	77 14
CASCADE MOUNTAINS.—High range of mountains running through Oregon and Washington Territories, parallel with the coast, and about 150 miles distant.....		
CASCADE RANGE.—Same as the last.....		
CHARCO ESCONDIDO, MEX.—A town of northeastern Mexico. Not far south of lat. 26.....		
CHARLESTON, S. C.—Near.....	33 00	80 00
CHEHALIS PRAIRIE, W. T.—Probably near the Chehalis river, emptying into the ocean on the west coast of Washington Territory. Mouth about.....	47 00	124 00
CHEYENNE RIVER, NEB.—A tributary of the Upper Missouri river, west side. Mouth about.....	45 00	100 40
CHEVATE SPRINGS, MEX.—In Chihuahua?.....		
CHICKWASS.—In Washington Territory?.....		
CHIHUAHUA CITY, MEX.—Capital of the province of Chihuahua. About.....	28 30	106 00
CHILE.—The particular region referred to is about Santiago.....		
CIMARRON RIVER, ARK.—A tributary of the Arkansas river. The particular locality referred to is Sand creek, where it is crossed by the Santa Fe road. About.....	37 30	101 20
CLARKE Co. VA.—A county towards the northeastern part of Virginia.....		
CLEVELAND, OHIO.—On Lake Erie. About.....	41 30	81 30

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
COAHUILA, MEX.—A province in the northeastern part of Mexico, south of the Rio Grande.....		
COLORADO BOTTOM, CAL.—Along the Colorado river, near Fort Yuma.....		
COLORADO DESERT, CAL.—Near Colorado river?.....		
COLORADO RIVER, CAL.—Emptying into the head of the Gulf of California.....		
COLUMBIA RIVER, O. T.—Emptying into the Pacific ocean at Astoria, (which see).....		
COLUMBUS, GA.—Near the boundary line between Georgia and Alabama. Near.....	32 30	85 00
COLUMBUS, OHIO.—Near the centre of the State. About.....	40 00	83 00
COOACHETOPE PASS.—In the Rocky mountains, in the ridge dividing the waters of Grand river, (of the Colorado of California,) and of the upper Rio Grande, and near the head waters of the Arkansas. About.....	38 00	107 00
COOK COUNTY, ILL.—In the northeastern portion of Illinois, bordering on Lake Michigan and Indiana.....		
COPPERMINES, N. M.—A former station of the United States and Mexican Boundary Survey, subsequently called Fort Webster. Not indicated clearly whether on a tributary of the Gila or Mimbres. About.....	33 00	108 00
COUNCIL BLUFFS CITY, IOWA.—On the Missouri river, a little above the mouth of the Platte, and not far from Major Long's station of Engineer Cantonment. Near.....	41 00	95 00
CRATER PASS, CASCADE MOUNTAINS, OREGON.—Near.....	44 00	121 30
CROSSING OF PECOS RIVER, TEXAS.—At the mouth of Delaware creek, on the road from San Antonio to El Paso. About.....	32 00	104 00
DANE COUNTY, WIS.—In the southern central part of Wisconsin, including in its limits Madison, the capital of the State.....		
DE KALB COUNTY, ILL.—In the northern part of Illinois.....		
DELAWARE CREEK, TEX.—See <i>Crossing of Pecos</i> .		
DES CHUTES RIVER, OREGON.—A tributary of the Columbia river from the south, east of the Cascade mountains. About.....		121 00
DETROIT, MICH.—About.....	42 20	83 00
DEVIL'S RIVER, TEX.; ALSO SAN PEDRO.—Tributary of the Rio Grande, on the road from San Antonio to El Paso. Mouth about.....	29 30	101 00
DONA AÑA, N. M.—West of Organ mountains, on the Upper Rio Grande. About.....	32 10	106 40
DURANGO, MEX.—In the province of Durango, Mex. About.....	24 00	104 00
EAGLE PASS, TEX.—On the Rio Grande, at Fort Duncan. About.....	28 50	100 30
EASTERN SHORE OF MARYLAND.—On the eastern side of Chesapeake bay.....		
ELIZABETHTOWN, N. Y.—In the northern part of the State, about eight miles west of Lake Champlain.....		
ELK RIVER, NEB.....		
EL PASO, TEX.—The town of El Paso is really in Mexico, very near the boundary line. The locality referred to is near to it on the opposite or American side of the Rio Grande. About.....	31 50	106 30
ENGELMANN'S CREEK, NEB.—On Lt. Bryan's route, in 1856.....		
ESPIA, SONORA.—A station of the United States Mexican boundary survey. About.....	31 20	108 00
ESSEX COUNTY, N. Y.—On the western side of Lake Champlain.....		
EUTAW, ALA.—Capital of Greene county, west of Black Warrior river.....		

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
FORT BELKNAP,* TEX.—On the Brazos, on the road from Preston to El Paso. Altitude, 1,609 feet?....	33 08	98 48
BERTHOLD.—On the Missouri river, (trading post,) just below the mouth of the Little Missouri.		
About	47 30	102 00
BLISS, TEX.—Directly opposite El Paso, (which see)		
BOISÉ, O. T.—On Snake river, just above mouth of Boise river, about half way between Wind river and Cascade mountains. About.....	44 00	117 00
BROWN, TEX.—(Brownsville.) Altitude, 50 feet.....	25 53	97 26
CHADBOURNE, TEX.—On a tributary of the Colorado river of Texas, north of Fort M'Kavett. Altitude, 2,120 feet.....	32 02	100 05
CLARK, NEB.—Trading post on Missouri river, about 100 miles below mouth of Little Missouri. About	47 10	101 00
CONRAD, N. M.—On the Rio Grande, 150 miles above El Paso. Altitude, 4,576 feet.....	33 34	107 09
DALLES, O. T.—South side of the Columbia, between Des Chutes river and Cascade mountains. .	45 36	120 55
DES MOINES, IOWA—South of the centre of Iowa. About.....	41 30	94 00
FILLMORE, N. M.—Near Mesilla, on the Rio Grande, forty miles above El Paso. Altitude 3,937 feet.....	32 13	106 15
JONES, CAL.—On Klamath river, about half way between the Pacific ocean and the Cascades. Altitude, 2,570 feet.....	41 36	122 52
KEARNEY, NEB.—On the Platte river. Altitude, 2,000 feet. (Lt. Warren).....	40 38	99 06
LARAMIE, NEB.—At the junction of Laramie river and the north fork of the Platte. Altitude, 4,250 feet	42 12	104 31
LEAVENWORTH, KANSAS.—On the west side of the Missouri river, above the mouth of the Kansas river	39 21	94 44
M'KAVIT, TEXAS.—On the San Saba, a branch of the Colorado of Texas. Altitude, 2,060 feet..	30 55	100 05
MASSACHUSETTS, N. M.—On head of Rio Grande, in San Luis valley. Altitude, 8,365 feet....	37 32	105 23
ORFORD, OREGON.—On the Pacific coast.....	42 44	124 29
PIERRE, NEB.—On the Missouri river, (Lt. Warren.) Altitude, 1,504 feet.....	44 20	100 24
READING, CAL.—On the Upper Sacramento, west of the Sierra Nevada. Altitude, 674 feet	40 30	122 05
RILEY, KANSAS.—Mouth of Republican river, west of Fort Leavenworth. About	39 00	97 00
RIPLEY, MIN., now FORT GAINES.—Near the head of the Mississippi river, a little south of west from the western end of Lake Superior.....	46 19	94 19
SARPY, NEB.—An old trading post on the Yellowstone river.....		
SMITH, ARK.—On the Arkansas river.....	35 23	94 29
STANTON, N. M.—On the Bonito, east of the Sierra Blanco. About	33 30	105 00
STEILACOOM, W. T.—Near the head of Puget's Sound, on the east side.....	47 10	122 25
TEJON, CAL.—At the head of the Tulare valley, lying between the coast range and the Sierra Nevada of California. About.....	35 00	119 00
THORN, N. M.—On west side of Rio Grande. About	32 40	107 00
UNION, NEB.—Trading post at the junction of the Yellow Stone and Missouri rivers. About...	48 00	104 00

* The latitudes and longitudes of the military posts are taken chiefly from the "Medical Statistics of the United States Army."

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
FORT VANCOUVER, W. T.—North side of Columbia river, opposite mouth of Willamette. About half-way between the Cascade mountains and Pacific coast.	45 40	122 30
WALLAWALLA, W. T.—On the south side of the Columbia, west of the Blue mountains. About.	46 00	118 40
WAYNE, INDIANA		
WEBSTER.—See also Coppermines. Altitude 6,350.....	32 47	108 04
YUMA, CAL.—At mouth of Gila river. Altitude 355 feet.....	32 32	114 36
FOXEBURG, PA.—Junction of Clarion river and Allegheny river		
FRONTERA, TEXAS.—See El Paso.....		
GARLANDSVILLE, MISS.—In Jasper county, towards the southeastern part of the State.....		
GARRETTSTOWN, O.—A village of Portage county, Ohio		
GILA RIVER, CAL.—A tributary of the Colorado river of California, running nearly east and west near the parallel of 33. Its mouth is at Fort Yuma, which see.....		
GRAND ISLAND OF PLATTE.—A long island of the Platte river, at Fort Kearney, which see.....		
GRAND WHITE RIVER, near LITTLE SALT LAKE.—Near the Wasatch mountains, in the central portions of Utah.....		
GREAT BEAR LAKE.—In the British possessions, about.....	65 00	
GREAT BEND OF MO.—A short distance above the mouth of the Little Missouri. Near.....	48 00	102 00
GREAR SALT LAKE.—In Utah Territory		
GREENHORN MOUNTAINS, NEB.—Locality not ascertained.....		
GREENLAND.—The locality referred to is the Danish settlement on the western coast.....		
GROSSE ISLE, MICHIGAN.—An island in Detroit river, a few miles below Detroit		
GUADALUPE BOTTOM, TEXAS.—Along the Guadalupe river, about 40 miles west of Indianola, on the road to San Antonio		
GUYAPUCO, MEX.—In north eastern Mexico, not far south of the Rio Grande of Texas.....		
HALIFAX, N. S.—In the middle southern part of Nova Scotia. About.....	44 40	63 30
HAYS COUNTY, TEXAS.—In the central part of the State, about 60 miles northeast of San Antonio.....		
HEART RIVER, NEB.—A tributary of the Missouri from the west. Mouth about.....	47 00	100 30
HINGHAM, MASS.—A village on Massachusetts bay, about 18 miles southeast of Boston.....		
HILLSBORO', OHIO.—In Highland county, Ohio, about 60 miles east by north of Cincinnati.....		
HOLMES' HOLE, MASS.—In the northern part of the island of Martha's Vineyard, about 60 miles southeast of Boston		
HUERFANO RIVER, KANSAS AND N. MEX.—A tributary of the Upper Arkansas, from the south. Its mouth about	38 00	104 20
HUMBOLDT BAY, CAL.....	40 46	124 09
HUMBOLDT RIVER, UTAH.—A river on the Great Basin, without outlet, near the parallel of.....	41 00	
INDIANOLA, TEXAS.—A town on Matagorda bay, Gulf of Mexico, now called more usually Powderhorn. About	28 30	96 30
INDIAN RIVER, FLA.—On the eastern coast of Florida, a little below its middle portion		
JACKSON COUNTY, N. C.—In the western part of North Carolina, bordering on Tennessee and South Carolina.....		

Alphabetical list of localities—Continued.

	Latitude.	Longitudo.
	° ' "	° ' "
JACKSON, ILL.—A town about 140 miles W. N. W. of Chicago.....		
JACKSONVILLE, FLA.—On the St. John's river, and near the northeastern corner of Florida.....		
JANOS, SONORA.—About.....	31 00	108 00
JORNADA DEL MUERTO, N. M.—A strip of desert to the east of the Rio Grande, and north of El Paso.....		
JUDITH RIVER, NEB.—A tributary of the Upper Missouri from the south, east of Fort Benton. Mouth about.....	47 40	109 30
KEMPER COUNTY, MISS.—In the eastern part of Mississippi, bordering on Alabama.....		
KING'S RIVER, CAL.—A small stream near the north border of Tulare county, emptying into the Tulare Lake. Mouth about.....	36 10	119 50
KLAMATH LAKES.—Two lakes forming the head of Klamath river; the lower on the line of Oregon and California; the upper in Oregon, just east of the Cascade mountains.....		
LABRADOR.....		
LAKE SUPERIOR.....		
LANSING, MICH.—Near the middle of the State, W. N. W. of Detroit.....		
LA PRAIRIE, CANADA.—A village of Canada, just opposite Montreal.....		
LARAMIE RIVER, NEB.—Tributary of the north fork of the Platte, from the south; its mouth at Fort Laramie, which see.....		
LEXINGTON, MO.—A town on the Missouri river, near the western border of the State.....		
LIBERTY COUNTY, GA.—In the southeastern part of Georgia, bordering on the ocean.....		
LIMPIO MOUNTAINS, TEXAS.—In the western part of Texas? Near.....	31 00	104 00
LITTLE BLUE RIVER, KANSAS.—A tributary of Kansas river from the north, between Forts Leavenworth and Riley. Mouth about.....	39 10	96 30
LITTLE MISSOURI RIVER.—Tributary of the Upper Missouri, from the southwest. Mouth about.....	47 30	102 00
LLANO ESTACADO, TEXAS.—High plateau of western Texas; sometimes called Staked Plains.....		
LONG LAKE, NEB.—Locality not ascertained; probably on or near the Upper Missouri, below Fort Union.....		
LOS ANGELES, CAL.—About forty miles from the coast, on the road from San Pedro to Fort Tejon. About.....	34 00	118 00
LOS NOGALES, SONORA. About.....	31 20	111 00
LOST RIVER, CAL.—In northern California, connected with Rhett lake, which see.....		
MADRID, N. Y.—In St. Lawrence county, northern New York, a little south of the St. Lawrence river.....		
MATAMORAS, MEXICO.—On the south bank of the Rio Grande, opposite Brownsville, and about 35 miles west of the Gulf of Mexico. About.....	25 50	97 20
MAUVAISES TERRES, NEB.—An extensive tertiary deposit between the Upper Missouri and the Platte.....		
MEADVILLE, PA.—Near the northwestern corner of Pennsylvania, not far from Lake Erie.....		
MEDICINE BOW BUTTE.—Hills near the head of Medicine Bow Creek?.....		
MEDICINE BOW CREEK.—Tributary of the north fork of the Platte, near its head, and west of the Black Hills. Mouth some 150 miles east of the South Pass, and about.....	42 20	107 00
MESILLA VALLEY, TEXAS.—In western Texas, on the western side of the Rio Grande, below Dona Ana, in the Gadsden Purchase.....		

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
MEXICO, CITY.—Capital of Mexico. About.....	19 30	99 00
MIDDLEBORO', MASS.—On the Fall River railroad, about 40 miles south of Boston.....		
MIER, TEXAS.—On the lower Rio Grande. About.....	26 30	99 30
MILK RIVER, NEB.—Tributary of the Upper Missouri, running nearly parallel with it on the north. Its mouth about.....	48 00	106 00
MILWAUKIE, WIS.—On the eastern side of Wisconsin, on Lake Michigan. About	43 00	88 00
MINIWAKAN LAKE, MIN.—In northwest Minnesota. Near	48 00	99 00
MOHAVE DESERT.—Near Mohave river, east of Fort Tejon and the Sierra Nevada. About.....	35 00	117 00
MONTEREY, CAL.—On the coast of California, south of San Francisco, (M. S. U. S. A.),.....	36 36	121 52
MONTEREY, MEX.—In the northeastern part of Mexico. About.....	25 40	100 30
MONTICELLO, MISS.—A village on Pearl river, about 85 miles south of Jackson.....		
MONTREAL, CANADA.—On the St. Lawrence river. About.....	45 30	73 30
MOUNT JOY, PA.—A village of Lancaster county, not far from the Susquehanna river.....		
MUSKEGET, MASS.—An island about five (?) miles long, half way between Martha's Vineyard and Nantucket. Not far from.....	41 30	70 30
NACHESS PASS, W. T.—In the Cascade mountains, north of the Columbia. About	47 00	
NAPA VALLEY, CAL.—In Napa county, situated about 30 miles northwest of San Francisco, and east of Sonoma county		
NASAS, RIO (COAHUILA).—A stream in the northeast portion of Mexico; tributary of the San Juan?		
NEW DUNGENESS, W. T.—A port on the Straits of De Fuca, a short distance east of Cape Flattery		
NEWFOUNDLAND ISLAND.—The principal point referred to here is the town of St. John's, almost the extreme eastern point of North America. About.....	47 30	52 50
NEW HARMONY, IND.—On the Wabash river.....		
NEW ORLEANS, LA.—About	30 00	90 00
NEW YORK CITY.—About	40 40	74 00
NICHOLS, N. Y.—In Tioga county		
NORTH PLATTE RIVER, NEB., OR NORTH FORK OF PLATTE.—The principal branch of the Platte river		
NOVA SCOTIA.....		
OAXACA, MEX.—A province and town of, in the south of Mexico. About.....	17 00	97 00
OGDENSBURG, N. Y.—On the St. Lawrence river, in northern New York.....		
OKANAGAN, W. T.—A British trading post, at the mouth of the river of the same name. About.....	48 00	120 00
OLYMPIA, W. T.—At the head of Puget's Sound. About.....	47 00	122 40
ONEIDA COUNTY, N. Y.—The locality referred to is the town of Waterville.....		
ORANGETHURGH, S. C.—A village and district in the southwest central part of South Carolina.....		
OREGON TERRITORY.....		
ORGAN MOUNTAINS, N. M.—A range of mountains extending north of El Paso and east of the Rio Grande		
OXFORD, MISS.—In Lafayette county, about 18 miles north of Jackson		
PARRAS, MEX.—On the border line of the provinces of Durango and Coahuila. About.....	25 30	102 30

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° /	° /
PASS CREEK, NEB.—Crossed by Lieut. Bryan's route of 1856. Precise locality not ascertained.....		
PECOS RIVER, TEX.—The principal tributary of the Rio Grande. Crossed on the road from San Antonio to El Paso, at Delaware creek, which see.....		
PEMBINA, MIN.—A town on Red River of the North, on the borders of Minnesota. About	49 00	97 00
PESQUIERIA GRANDE, MEX.—In New Leon, on the San Juan river. About.....	26 00	101 00
PETALUMA, CAL.—In Sonoma county, at the head of Petaluma creek, about 35 miles north of San Francisco. About	38 20	122 40
PIT RIVER, CAL.—Head of upper Sacramento river, near the northeastern corner of the State		
PLATTE RIVER, NEB.		
PLUM SPRINGS, IOWA.—In Delaware county, near the middle of the eastern border of the State.....		
POLE CREEK, NEB.—Sometimes called Lodge Pole creek. A tributary of the south fork of the Platte Along the line of about.....	41 00	
PORT CLINTON, OHIO.—On Lake Erie, at the mouth of Portage river.....		
PORT TOWNSEND, W. T.—On the Straits of De Fuca. About.....	48 00	
POSA CREEK, CAL.—In Southern California, on Lieut. Williamson's line of 1853. Precise locality not ascertained.....		
PRAIRIE MER ROUGE, LA.—In Morehouse parish, in the northeastern part of Louisiana, east of the Washita river		
PRESIDIO, CAL.—Not far from San Francisco?		
PRESIDIO DEL NORTE, MEX.—On the south side of the middle Rio Grande, of Texas. About.....	29 30	104 30
PRINCE GEORGE'S, MD.—That portion of Maryland on the northeastern border of the District of Columbia.		
PRINCETON, MINN.—In Benton county, a county on the east side of the Mississippi river, near the line of 46 deg.....		
PUGET'S SOUND, W. T.—In the northwestern part of Washington Territory, connected with the Pacific by the Straits of Juan de Fuca		
QUASQUETON, IOWA.—In Buchanan county, towards the middle of the eastern border, about 55 miles northwest of Iowa City.....		
QUEBEC, CANADA.—Near.....	47 00	71 00
RACINE, WIS.—On the western shore of Lake Michigan, a little south of Milwaukee. Near.....	43 00	88 00
RALEIGH, N. C.—Near the centre of the State. About.....	35 50	79 50
RAYNOR BEACH, L. I.—On the south side of Long Island, a short distance east of Brooklyn.....		
RED FORK OF ARKANSAS.—Tributary of the Arkansas from the west, near the parallel of 36 deg.....		
RED RIVER, ARK.—Tributary of the Mississippi from the west.....		
REDWOODS, CAL.—Not far from Petaluma, which see.....		
REE FORK, NEB.—Sometimes called Arickaree Fork. Tributary of the Republican Fork of the Kansas from the south. About.....	40 00	102 00
REPUBLICAN FORK OF THE KANSAS.—Sometimes called Pawnee river. Tributary of the Kansas from the north. Mouth at Fort Riley, which see		
RHETT LAKE, CAL.—Near the northern line of California, east of the Cascade range. Connected with Lost river. About.....	42 00	121 00

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
RICEBORO', GA.—In Liberty county, Georgia, which see		
RINGGOLD BARRACKS, TEX.—On the lower Rio Grande, about 130 miles west of the Gulf. Geographical position from Med. Stat. U. S. A.....	26 22	98 47
RIO GRANDE, TEX.—River separating Texas from Mexico		
RIO NASAS, COAHUILA.—See Nasas.....		
ROCK CREEK, NEB.—Tributary of the Republican Fork of the Kansas, west of the Ree Fork. Crossed by Lt. Bryan's route of 1856. Near.....	40 10	102 10
ROCK CREEK, WIS.....		
ROWLEYSBURG, VA.—Preston county, Va. On the Cheat river, west of the summit level of the Baltimore and Ohio Railroad.....		
SAG HARBOR, L. I.—Near the eastern end of Long Island.....		
ST. JOHN'S RIVER, FLA.—In the northeastern part of the State.....		
ST. LAWRENCE COUNTY, N. Y.—In the northern part of the State, bordering on the St. Lawrence river.....		
ST. LOUIS, MO.—About	38 40	90 20
ST. MARY'S MISSION, ROCKY MTS.—A Catholic missionary station among the Flatheads in Washington Territory, west of Rocky Mountains, on the St. Mary's Fork of the Bitterroot. Near.....	46 30	112 00
ST. SIMON'S ISLAND, GA.—On the coast of Georgia, below Savannah.....		
SALEM, N. J.—Western part of the State; on the lower part of Delaware river.....		
SALTILLO, MEX.—In Coahuila, west of Monterey, Mex. About.....	25 20	101 20
SALT LAKE, UTAH.—About.....	41 00	113 00
SAN ANTONIO, TEX.—On the San Antonio river. Altitude 600 feet. (M. S. U. S. A.).....	29 25	98 25
SAND CREEK OF CIMARRON.—See Cimarron.....		
SAN DIEGO, CAL.—Near the southwestern point of California. Altitude 150 feet. (Geographical position from the M. S. U. S. A.).....	32 42	117 14
SAN ELIZARIO, TEX.—On the Rio Grande, just below El Paso		
SAN FRANCISCO, CAL.—Coast of California. (M. S.).....	37 48	122 26
SAN FRANCISCO MOUNTAINS, N. M.—On the routes of Captains Sitgreaves and Whipple. About.....	35 00	111 30
SANGRE DEL CRISTO PASS.—Pass in the Rocky mountains, near Fort Massachusetts, which see		
SAN JOSE, CAL.—In Santa Clara county, near the town of Santa Clara.....		
SAN LUIS SPRINGS, SON. About.....	31 20	109 00
SAN MIGUEL, CAL.—The westernmost of a series of islands off the coast of California, on the 34th parallel, and about 30 miles south of the main land. The island about ten miles long.....		
SAN PABLO BAY, CAL.—North of the bay and city of San Francisco		
SAN PEDRO RIVER, TEX.—See Devil's river, Texas.....		
SANTA CATERINA, MEX.—A few miles west of Monterey in northern Mexico.....		
SANTA CLARA, CAL.—In Santa Clara county, California, near the head of San Francisco bay, about 40 miles southeast of San Francisco. About	37 20	122 00
SANTA CRUZ, SONORA.—In Sonora, south-southwest of Tucson. About.....	31 00	110 20
SANTA ISABEL, CAL.—In southern California, on San Diego river, about 35 miles northeast of San Diego.....		

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
SANTA ROSALIA, MEX.—Northeastern Mexico, west of Matamoras. Precise locality not ascertained.....		
SARANAC LAKES, N. Y.—In the northern part of the State, among the Adirondac mountains		
SAVANNAH, GA.—Near the coast. About.....	32 00	81 00
SAWATCH PASS, ROCKY MTS.—Probably at the entrance of Sawatch valley, and near the Coochetopa Pass.....		
SELMA, ALA.—Near the centre of the State		
SEMIPALATINSK, SIBERIA.....		
SHOALWATER BAY, W. T.—A shallow bay on the Pacific coast, just north of the mouth of the Columbia river. About	46 30	124 00
SIoux CITY, IOWA.—On the eastern side of the Missouri, near the mouth of Big Sioux river (Lt. W).....	42 32	96 26
SNAKE RIVER, O. T.—Head of Lewis' fork of the Columbia. Mouth about.....	43 30	117 00
SNOQUALME PASS, CASCADE MTS.—At the head of the Yakima river, probably now called Yakima Pass. About	47 20	121 20
SOCIETY HILL, S. C.—In Darlington district, in the northeast portion of the State. Near the Great Pedee river. About	34 30	80 00
SOUTH PASS OF ROCKY MOUNTAINS.—About	42 30	109 00
SPOKANE PLAIN, W. T.—Near the Spokane river.....		
SPOTTSYLVANIA COUNTY, VA.—Near the middle of the eastern part of the State. Its centre about.....	38 15	77 30
STEILACOOM, W. T.—On Puget's Sound, near the head	47 00	122 30
STEBEN, ME.—In Washington county, in the eastern part of the State. About	44 25	67 50
STOCKTON, CAL.—In San Joaquin county, about 65 miles nearly east of San Francisco		
TAMAQUA, PA.—In Schuylkill county, near the foot of the Broad mountain.....		
TARBORO', N. C.—In Edgecomb county, on the Tar river. About.....	35 50	77 40
TCHUCKTCHI COUNTRY.—The northeastern corner of Asia		
TEJON VALLEY, CAL.—Near the Tejon Pass and Fort Tejon, which see.....		
TOMALES BAY, CAL.—Coast of California, about 40 miles north of San Francisco		
TREMONT, ILLINOIS.—In Tazewell county		
UNION COUNTY, ILLINOIS.—Near the southern point of the State.....		
UNION COUNTY, MO.....		
UPPER DARBY, PA.—In Delaware county, a few miles west of Philadelphia.....		
UPPER DES CHUTES RIVER.—See Des Chutes river		
UPPER MISSOURI RIVER.—The portion above the mouth of the Platte		
VANCOUVER ISLAND.—Immediately north of Washington Territory, on the Pacific coast.....		
VANCOUVER, O. T.—See Fort Vancouver.....		
VERMILION PRAIRIE, NEB.—Prairie on the Vermilion river?.....		
VERMILION RIVER, NEB.—On the north side of the Missouri, about 60 miles above Sioux city.....	23 40	99 00
VICTORIA, MEX.—In the northeastern portion of Mexico, province of Tamaulipas. About.....	32 00	106 00
WACO TANKS, TEXAS.—A short distance northeast of El Paso. Near		

Alphabetical list of localities—Continued.

	Latitude.	Longitude.
	° ' "	° ' "
WASHINGTON, D. C.—Latitude nearly	38 54	77 30
WASHINGTON, MISS.—In Adams county, near Natchez		
WATERVILLE, N. Y.—Oneida county, New York		
WEST NORTHFIELD, ILL.—In Cook county, in the northeast corner of the State, about 15 miles from Chicago. About	41 40	87 50
WETHERSFIELD, CT.—Near the centre of the State		
WHITE EARTH RIVER, NEB.—(White river?) Tributary of the Missouri from the west. Near	43 00	
WHITE RIVER, CASCADE MOUNTAINS, W. T.		
YELLOWSTONE RIVER.—The principal tributary of the Upper Missouri ; its mouth at Fort Union, which see		



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*The following list of illustrations embraces all that have been prepared for the present volume, as well as those intended to accompany the special reports of the different railroad parties. The plates of the latter series bear on their upper border the official name of their respective surveys, as mentioned also in brackets after the number of the plate in the list, and it is to the reports of the parties thus indicated that reference is to be made for any figures not found in this volume. The names of the officers in command of the different lines of survey are as follows:

47TH PARALLEL.—Governor I. I. Stevens in command. Zoologists, Dr. George Suckley, U. S. A., and J. G. Cooper, M. D.
38th, 39th, 41st PARALLEL.—Captain J. W. Gunnison first in command, succeeded by Captain E. G. Beckwith. Zoologists Mr. Kreutzfeldt and Mr. Snyder.

35TH PARALLEL.—Captain A. W. Whipple in command. Zoologists, C. B. R. Kennerly, M. D., and H. B. Möllhausen.

32d PARALLEL.—Captain J. Pope in command.

CALIFORNIA.—Lieutenant R. S. Williamson in command. Zoologist, A. L. Heermann, M. D.

CALIFORNIA AND OREGON.—Lieutenant R. S. Williamson in command. Report presented by Lieutenant H. L. ot. Zoologists, E. Sterling, M. D., and J. S. Newberry, M. D. Report prepared by the latter.

Additional references to the expeditions under which the collections described were made, will be found in the introductory remarks at the beginning of the volume.

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Perognathus monticola, Baird.—Skull, Plate LI, fig. 3.

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ANTILOPINAE.

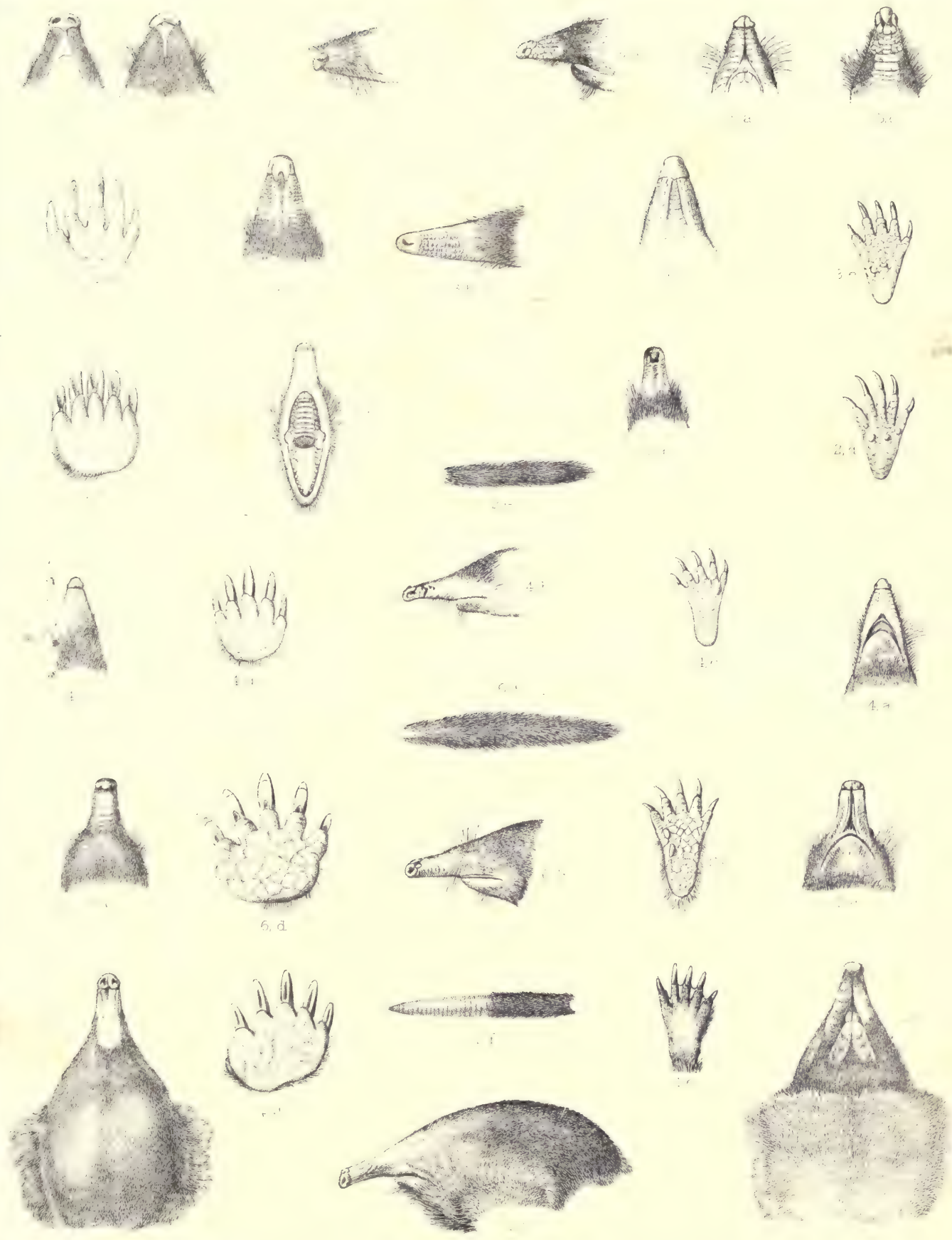
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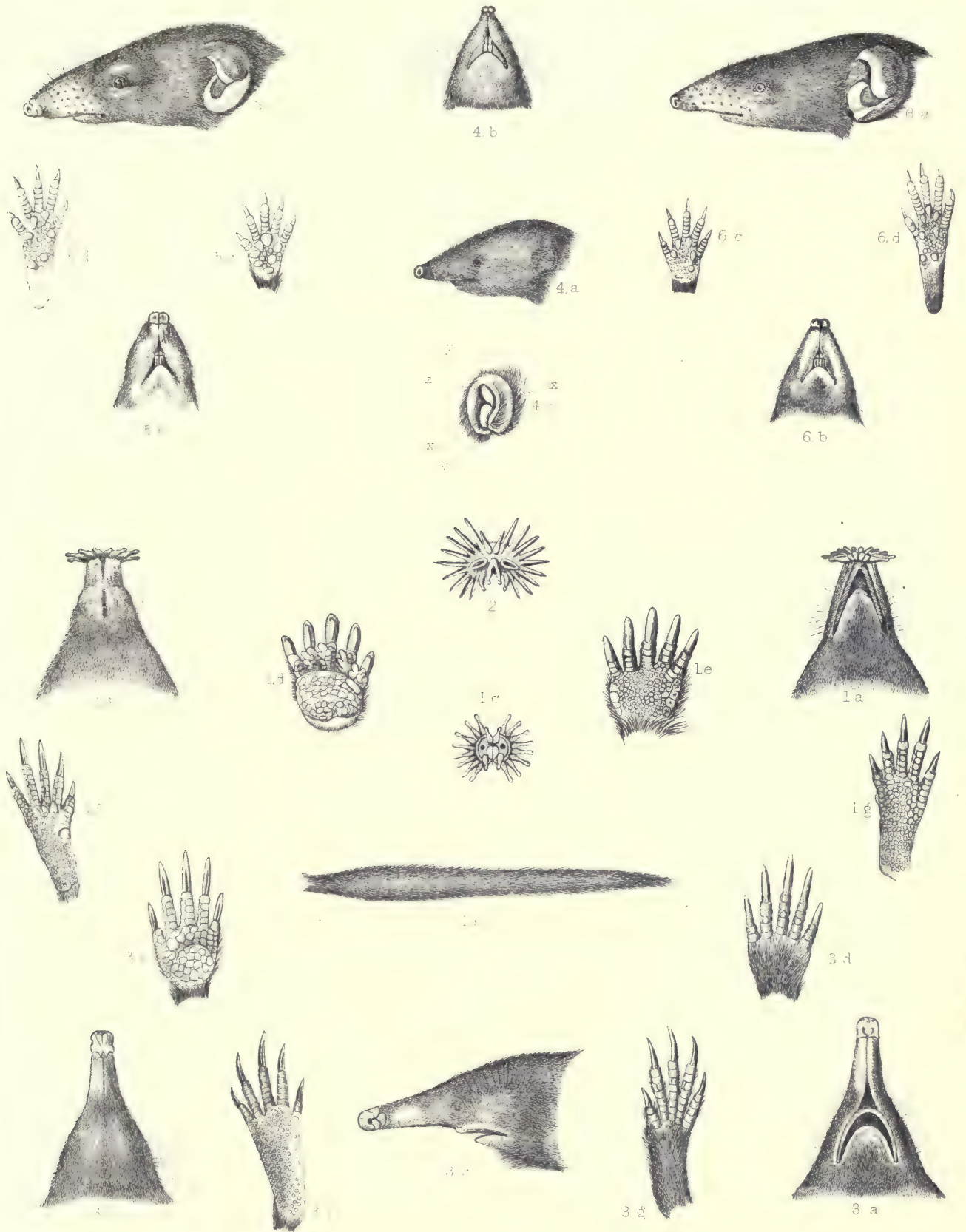
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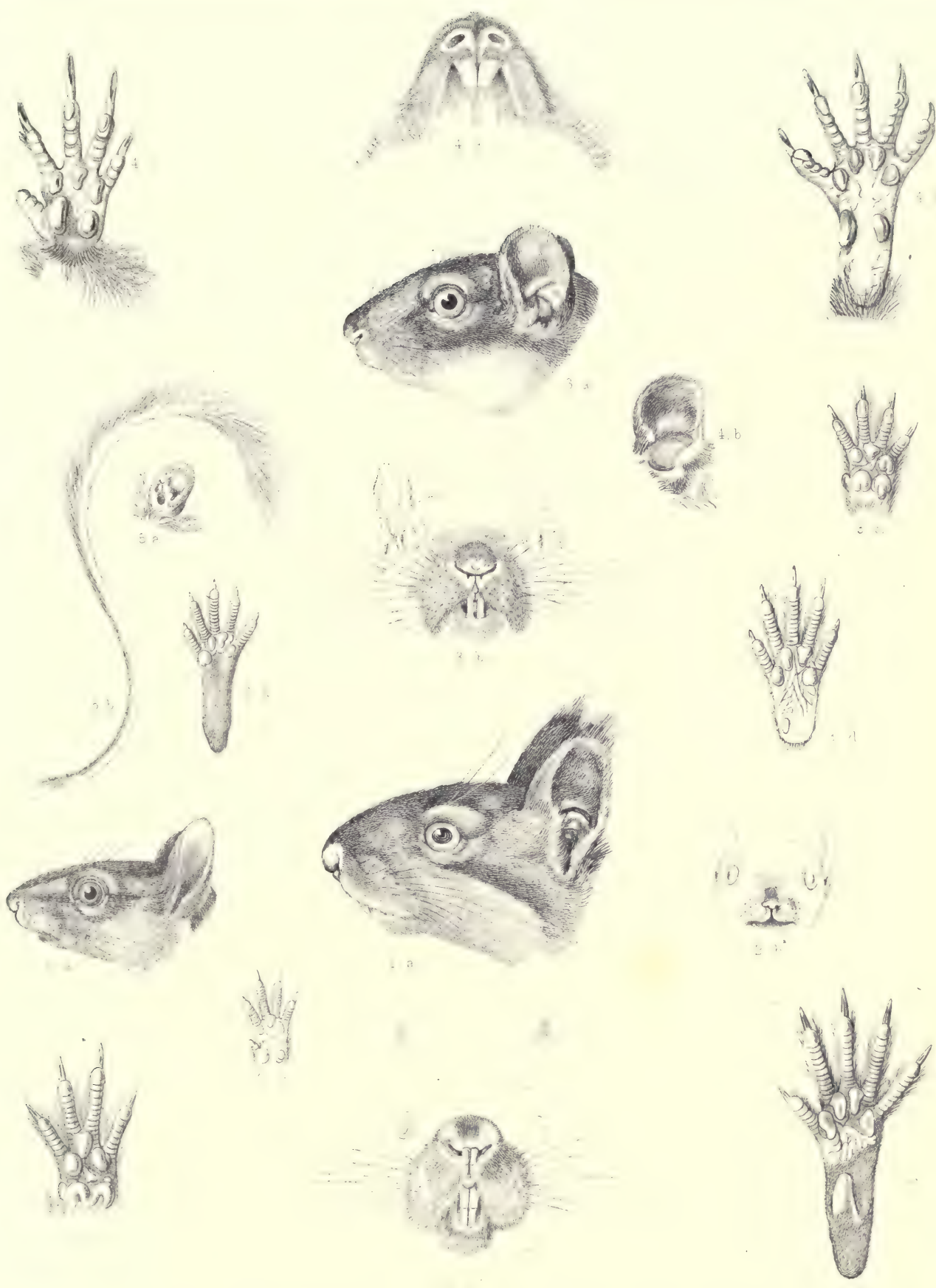
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- Ovibos moschatus*, Blainville.—Muzzle, wood-cut, fig. 33, p. 681.
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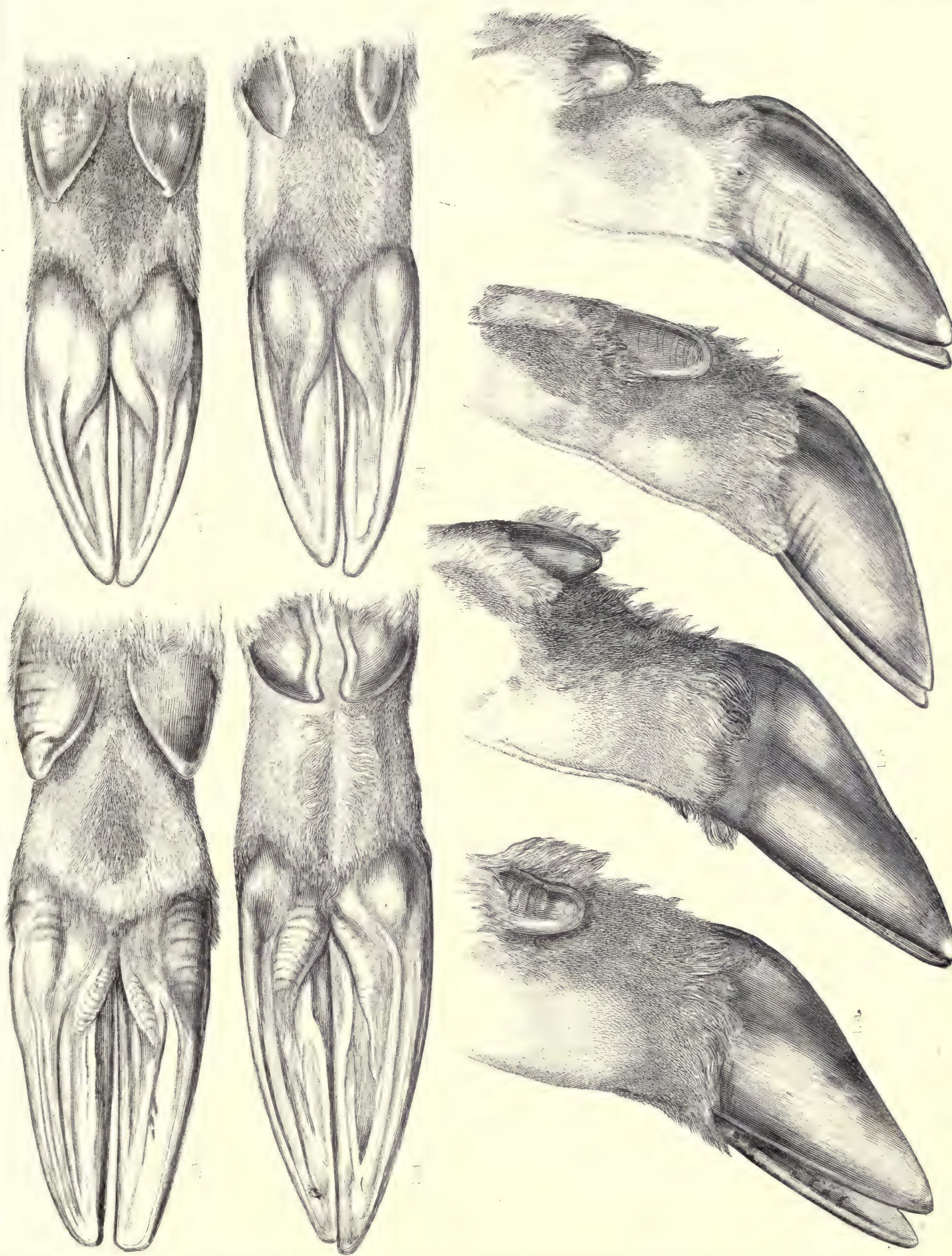


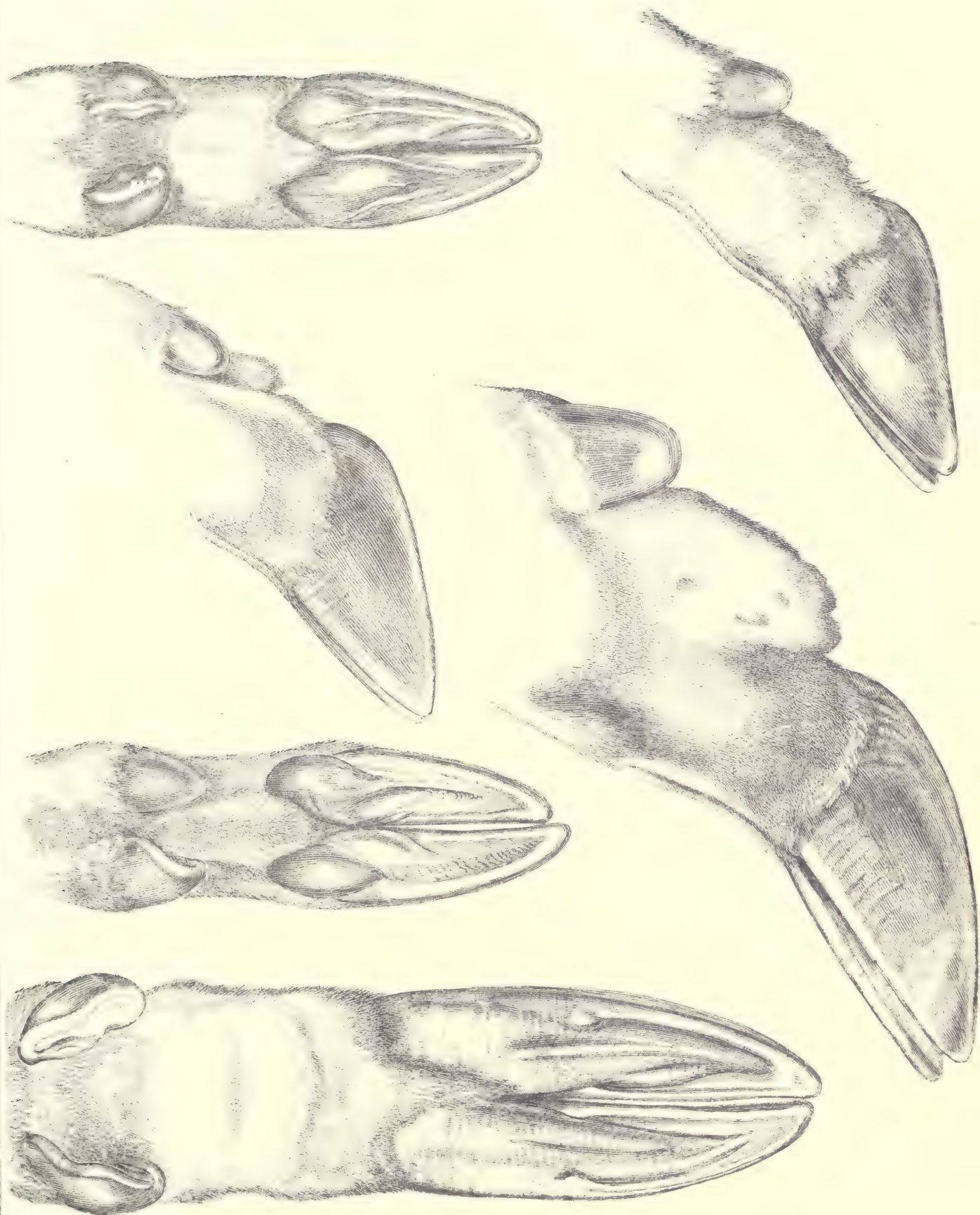


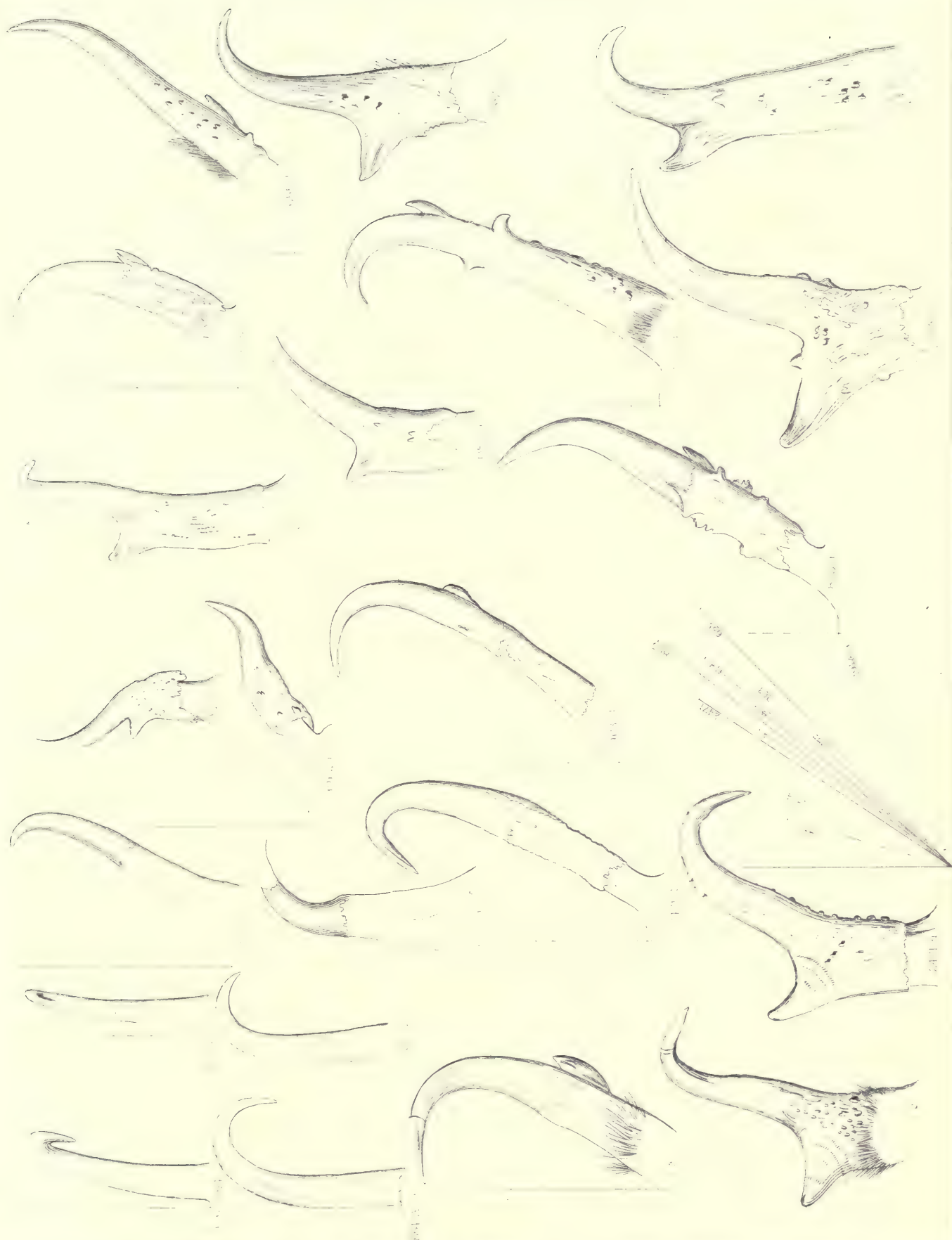














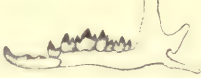
184 *Sorex araneus* Linn.



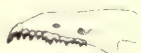
185 *Sorex vagrans*, Cooper



Sorex trowleyi Baird



186 *Sorex mordax* (Linn.)



1686. *Sorex thompsoni* Baird



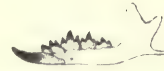
1685. *Sorex haydeni* Baird



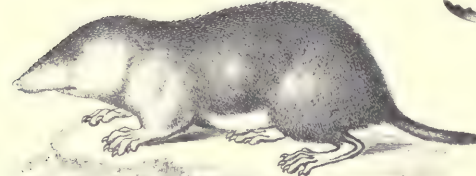
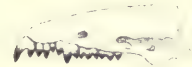
167. *Sorex arcticus* Baird



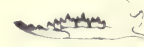
1674. *Sorex leucurus* Baird



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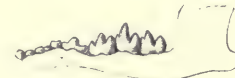
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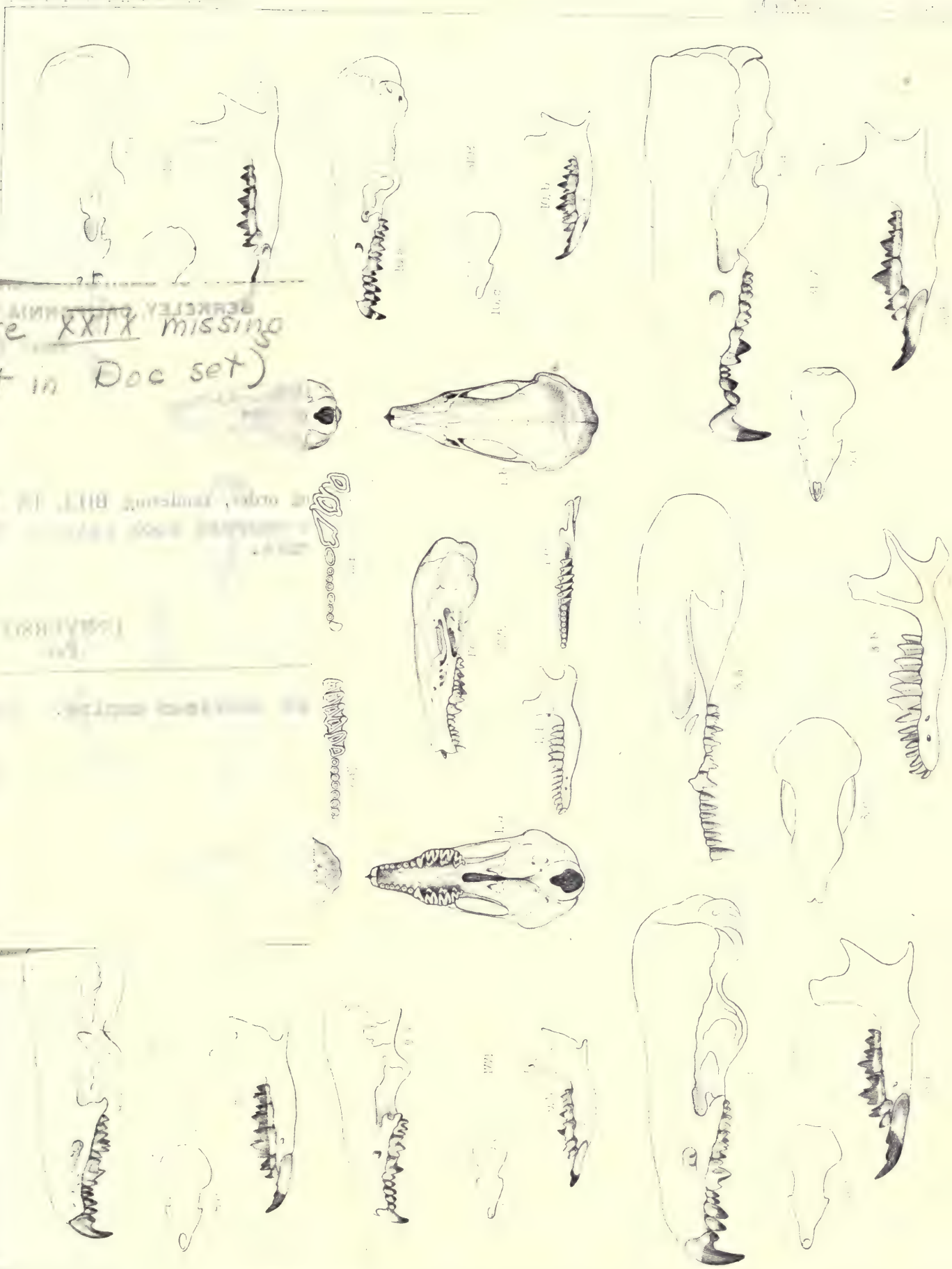
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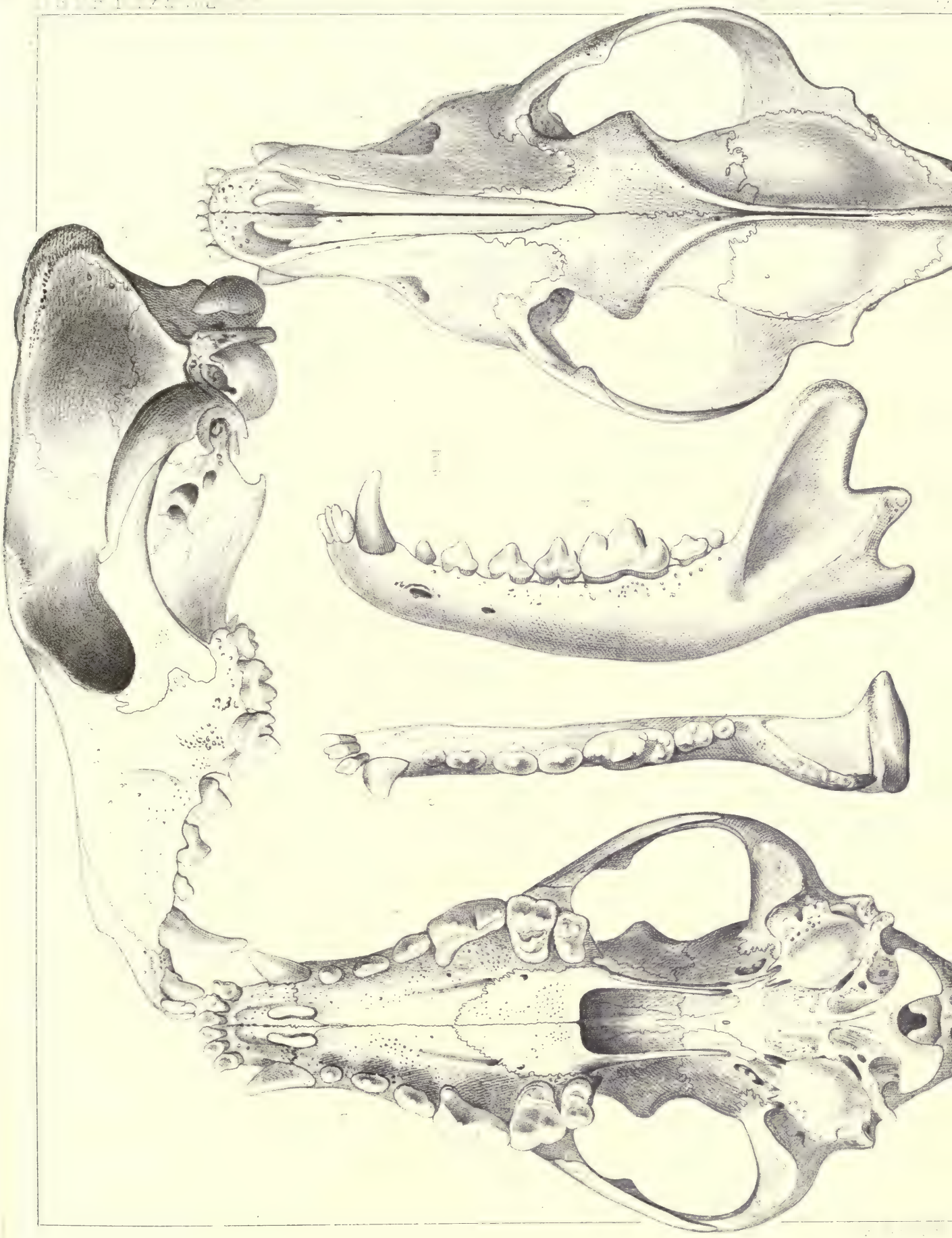
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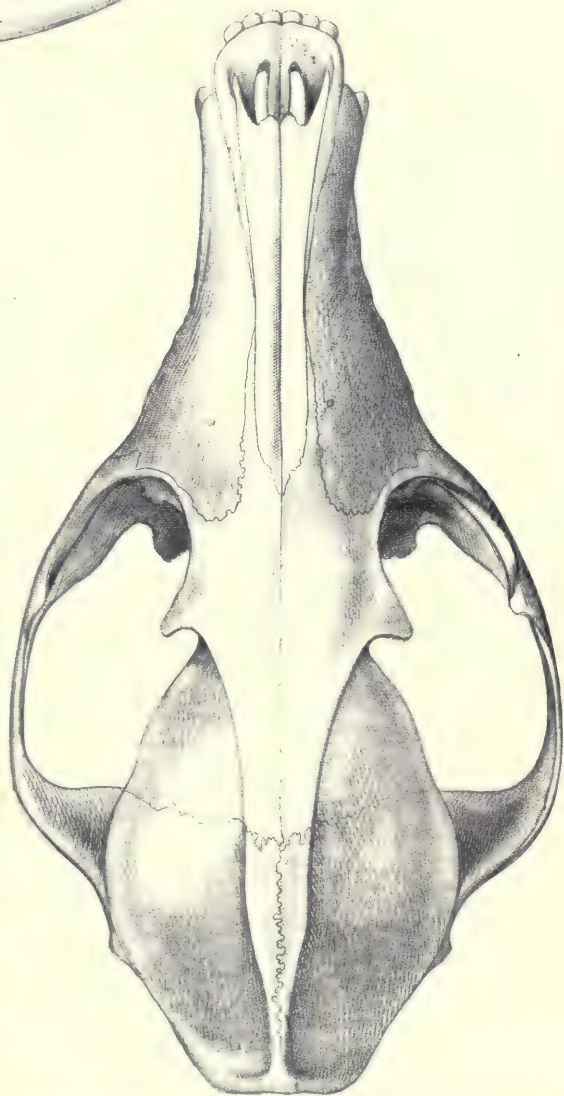
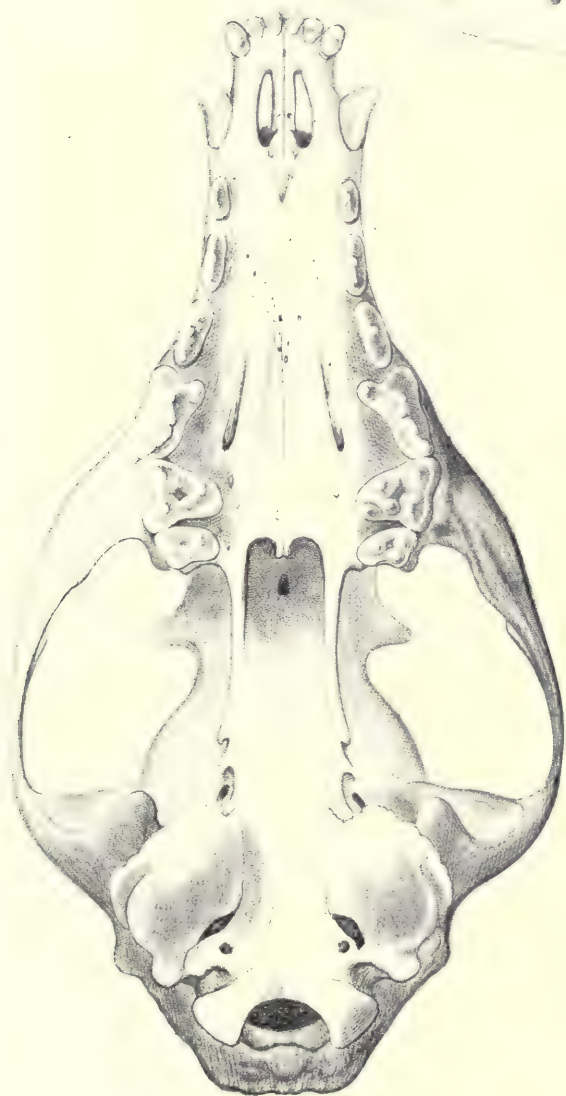
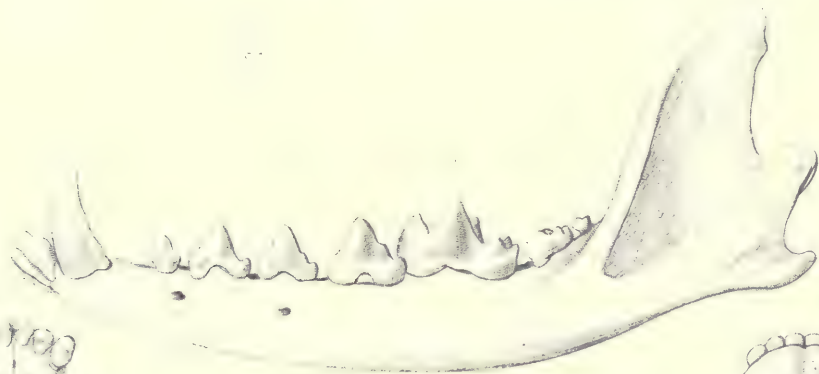
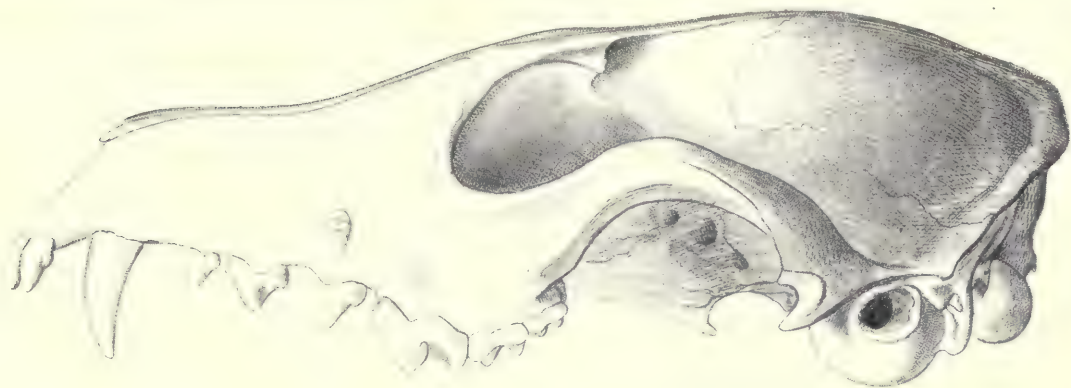
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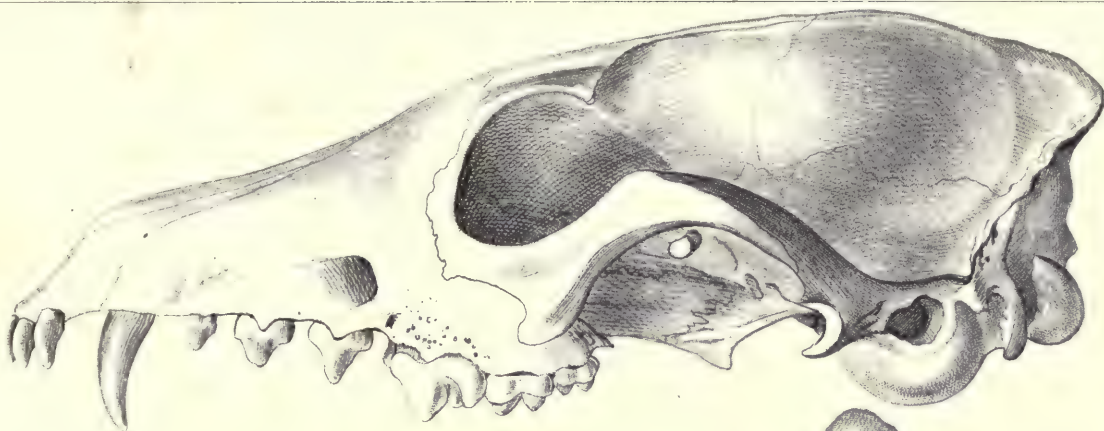
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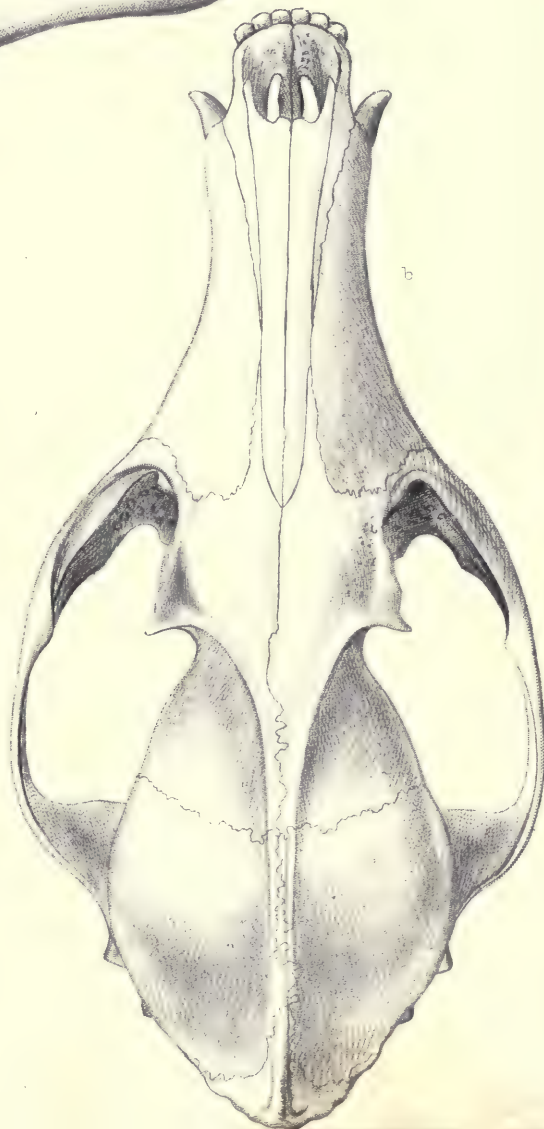
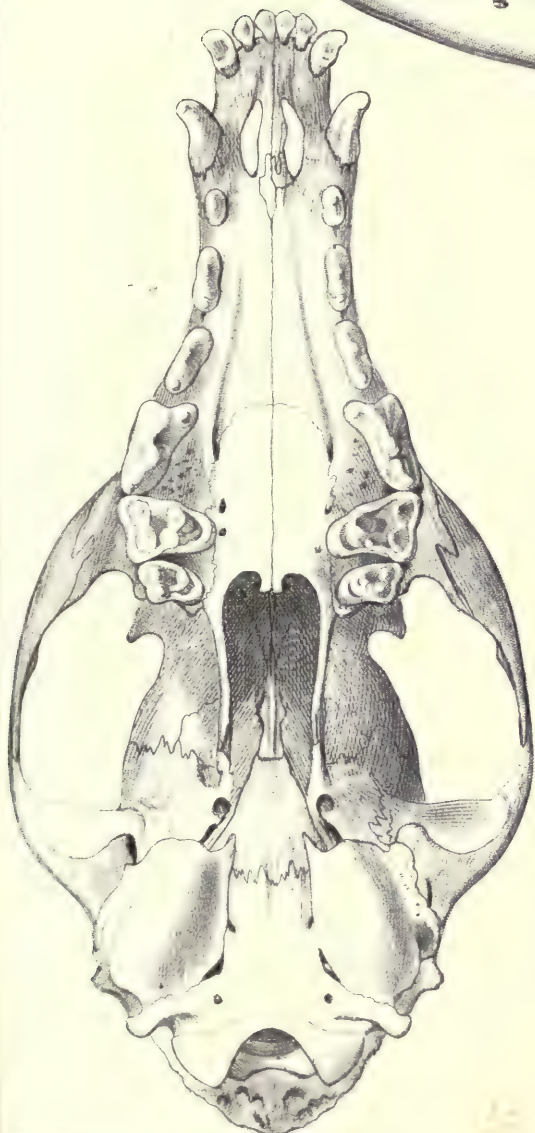
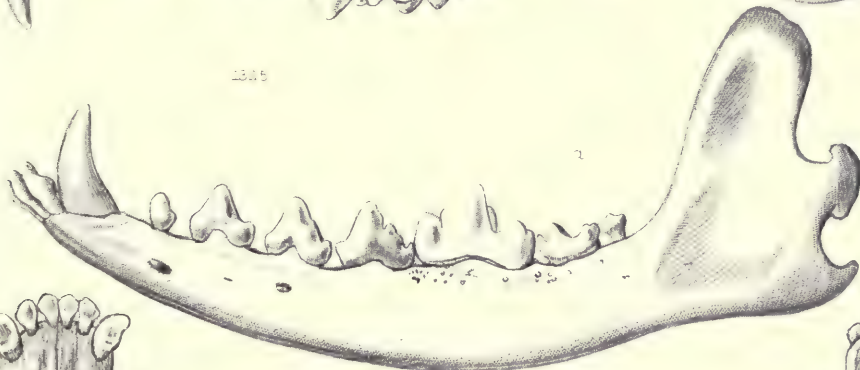


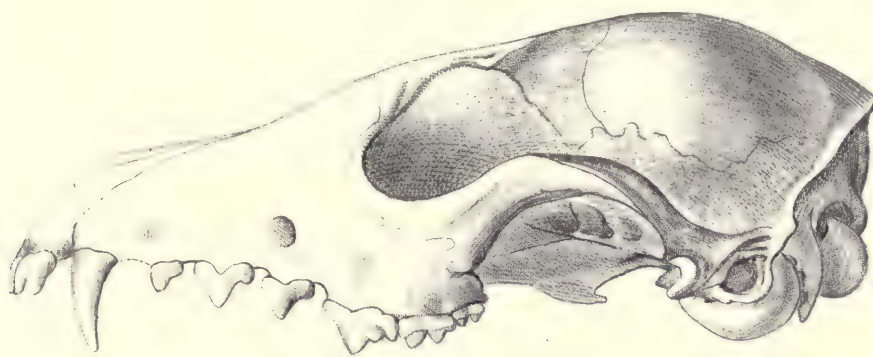




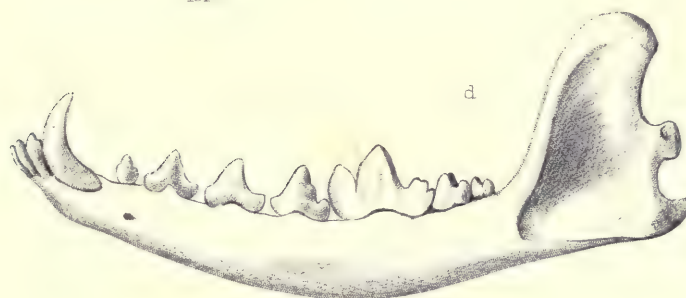


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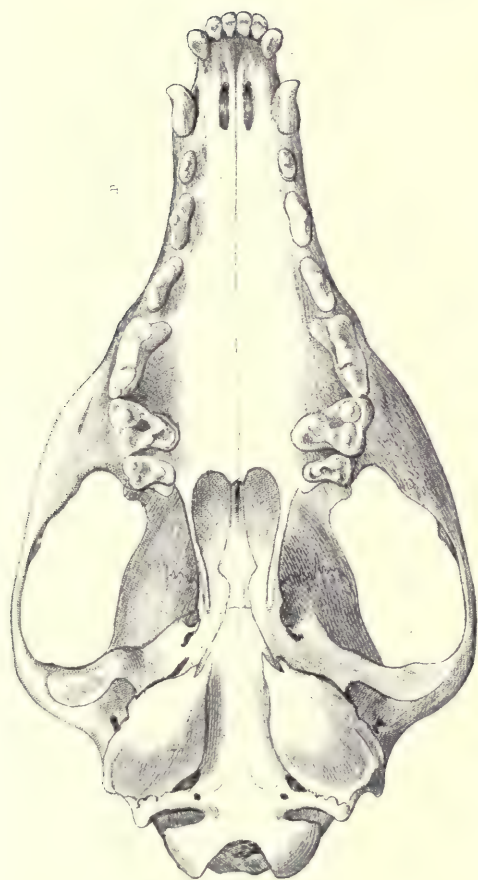




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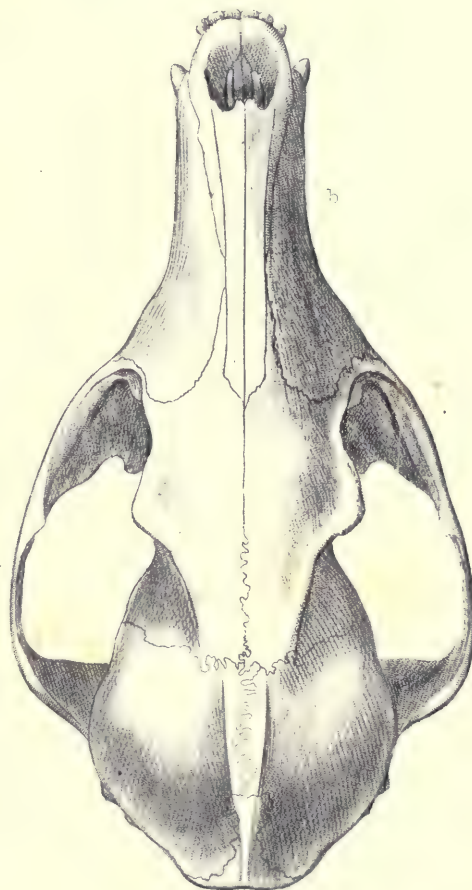
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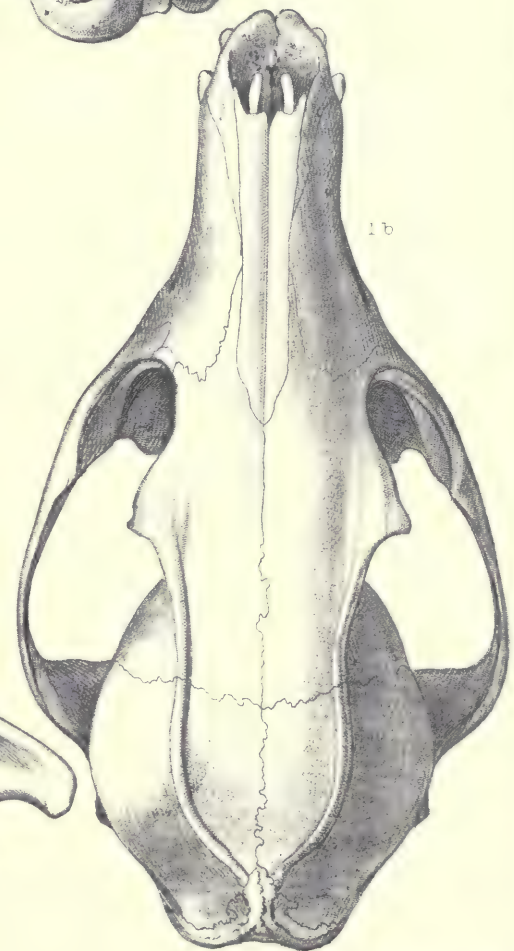
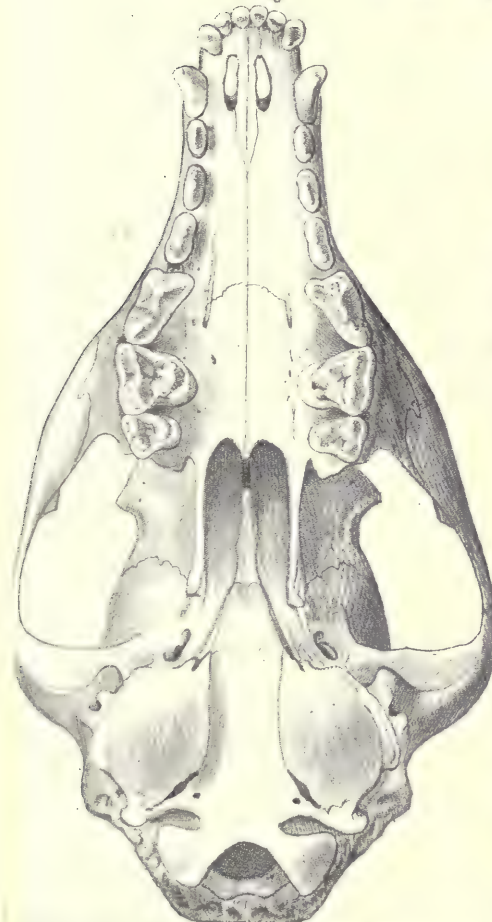
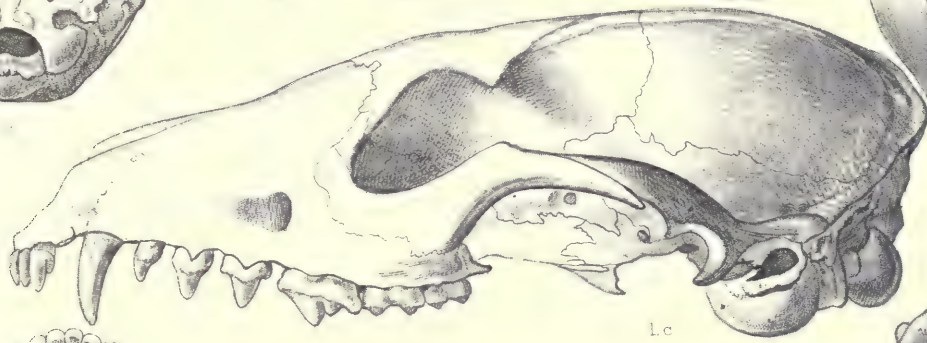
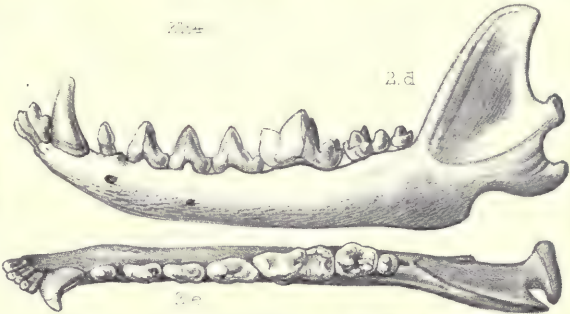
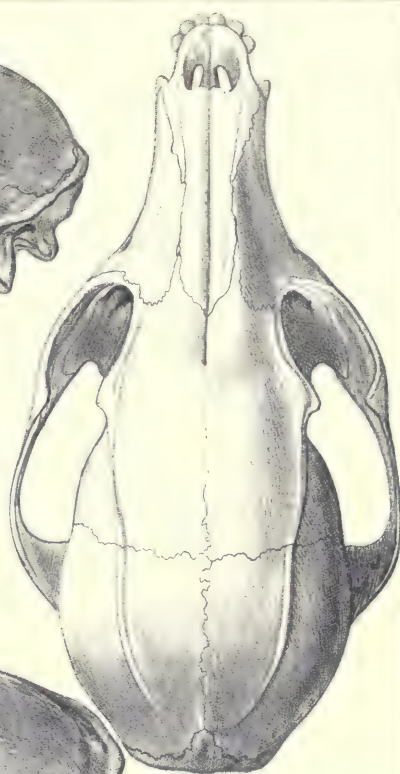
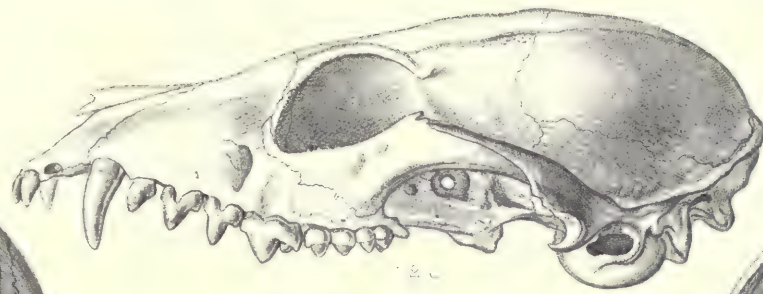
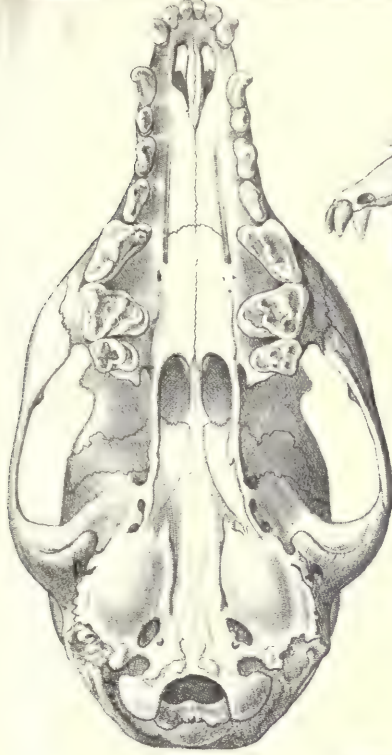
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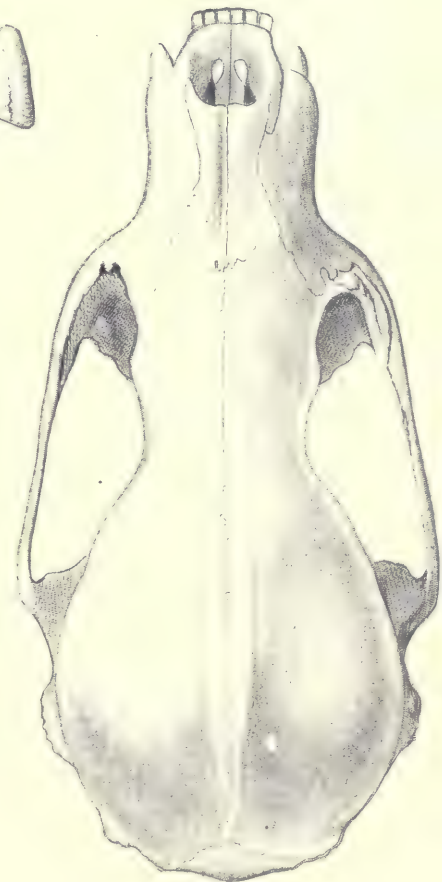
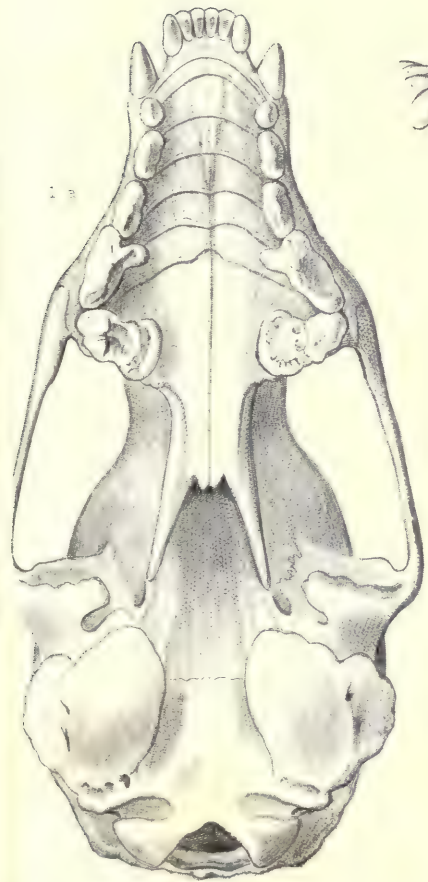
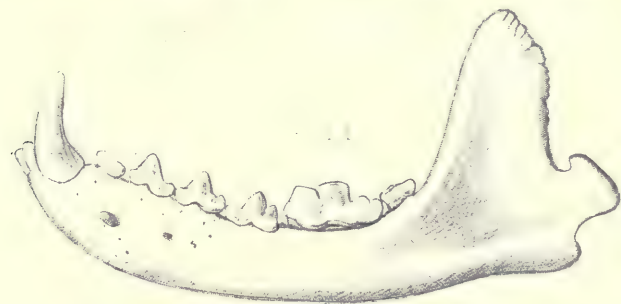
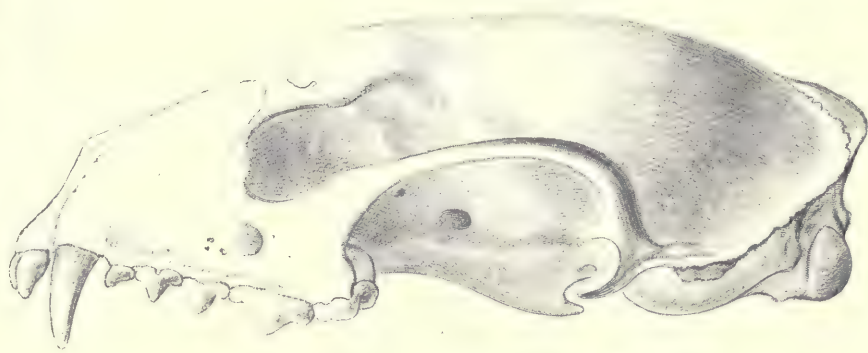
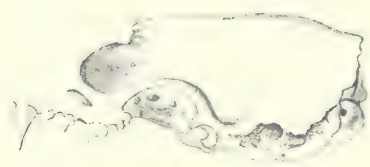


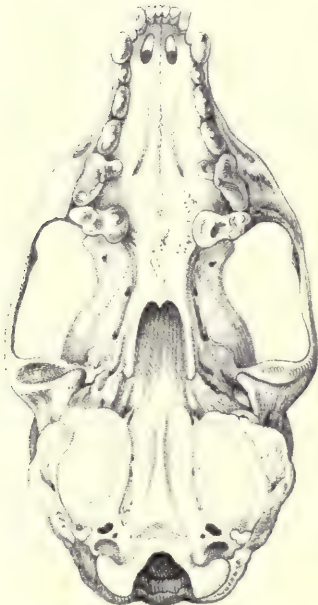
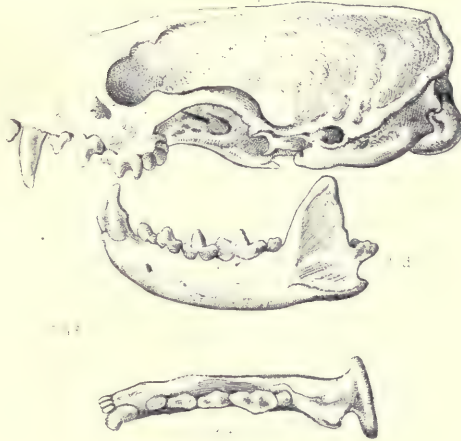
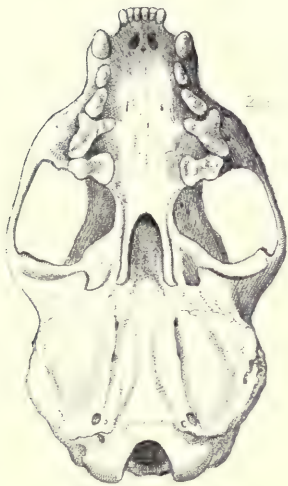
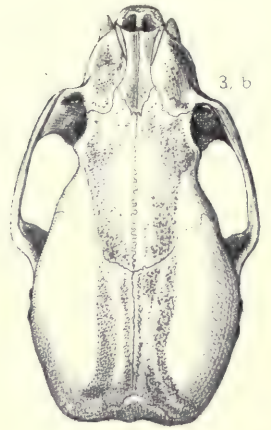
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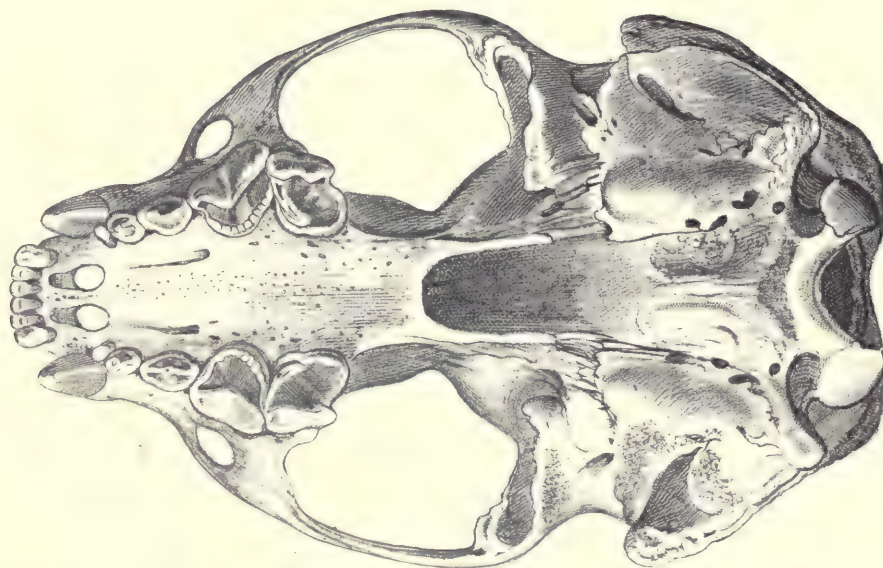
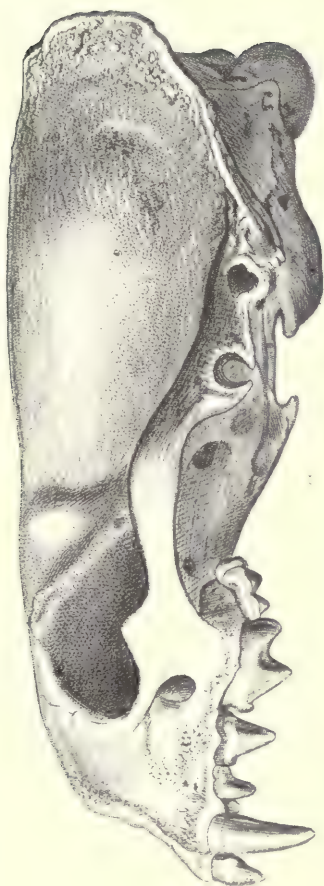
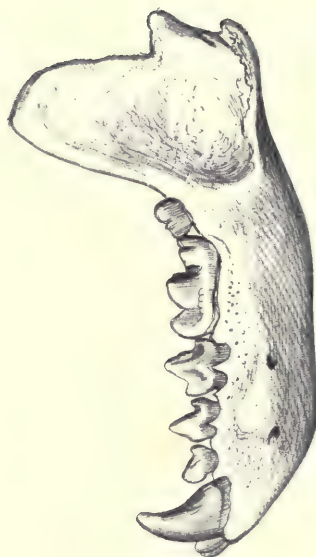
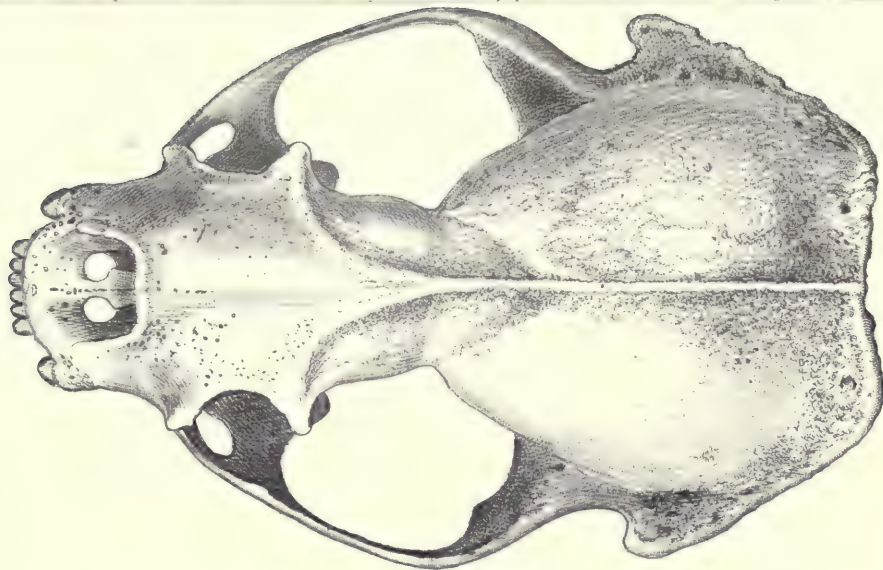


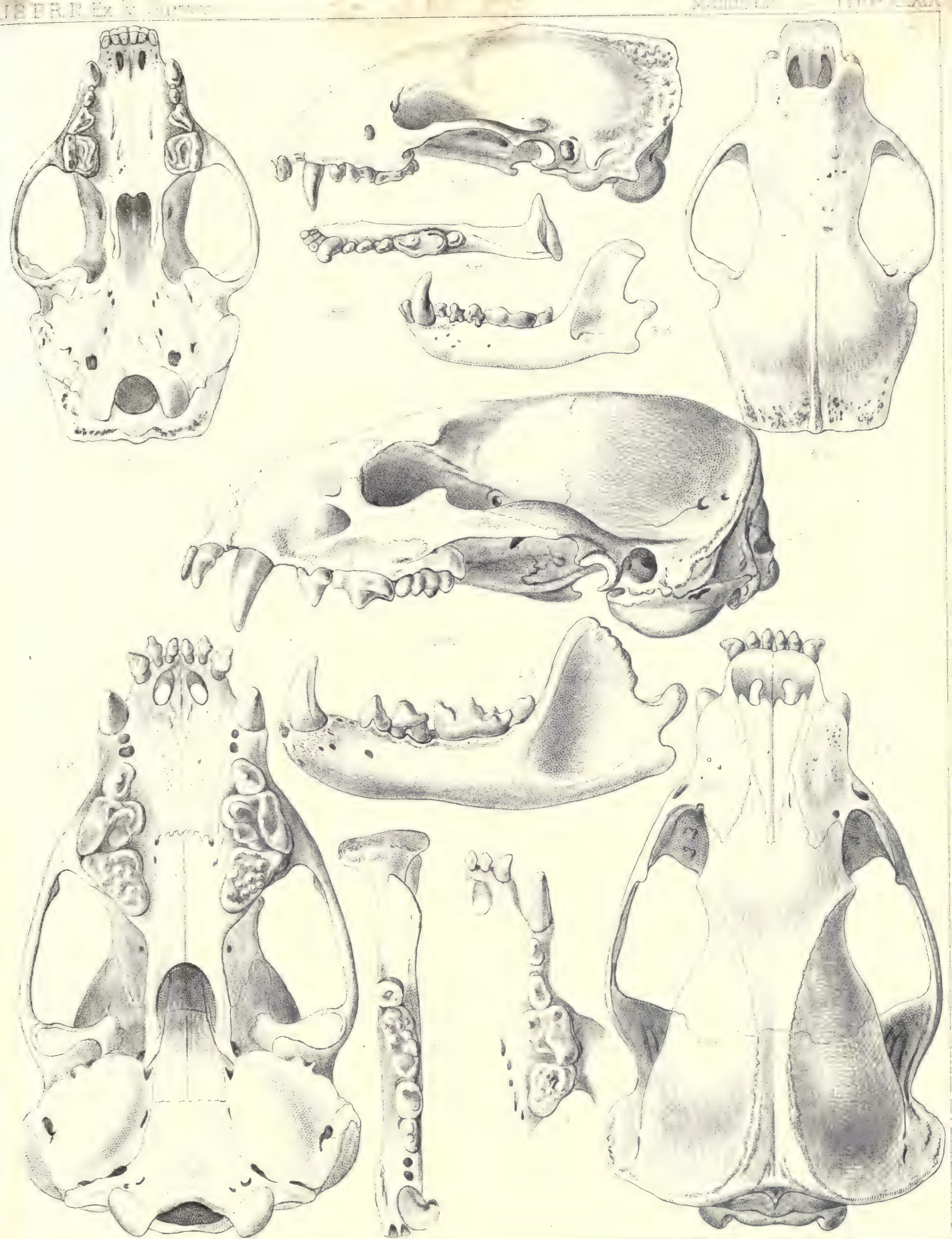
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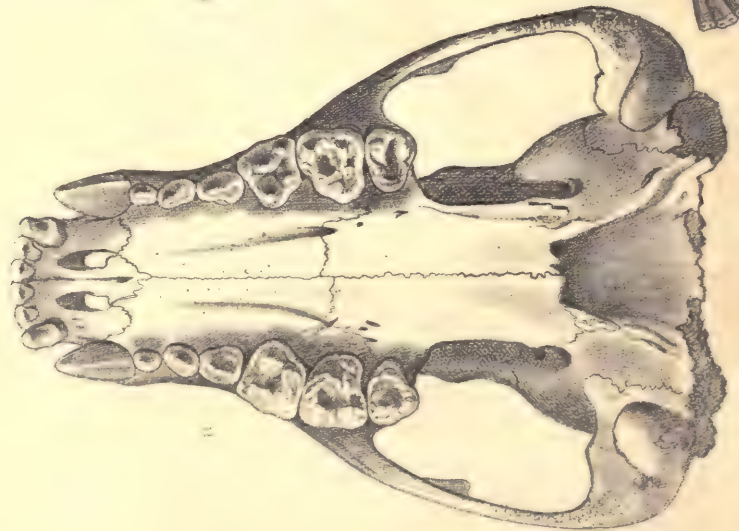
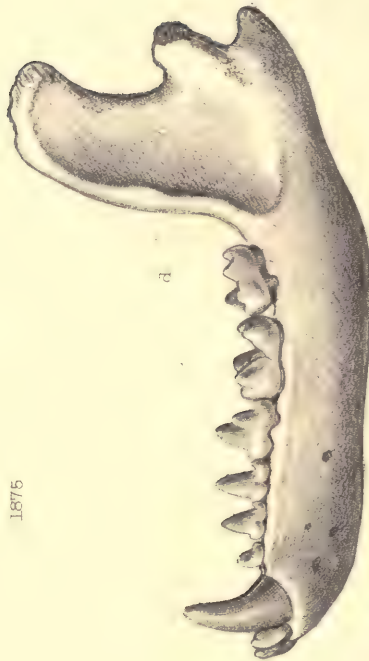
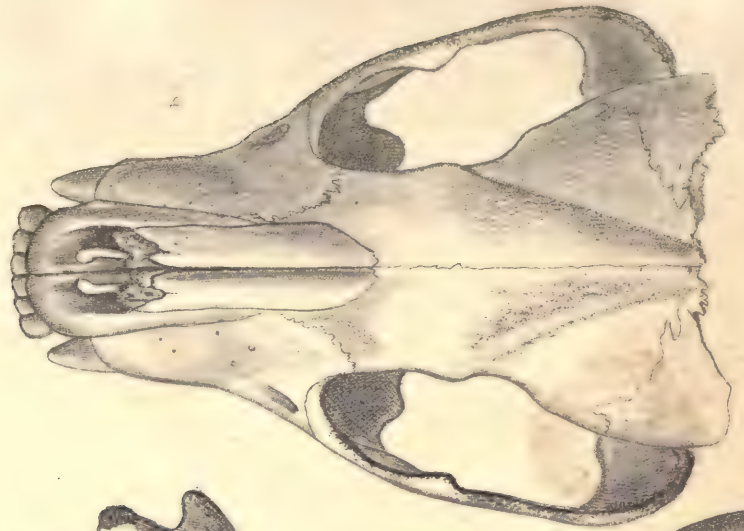




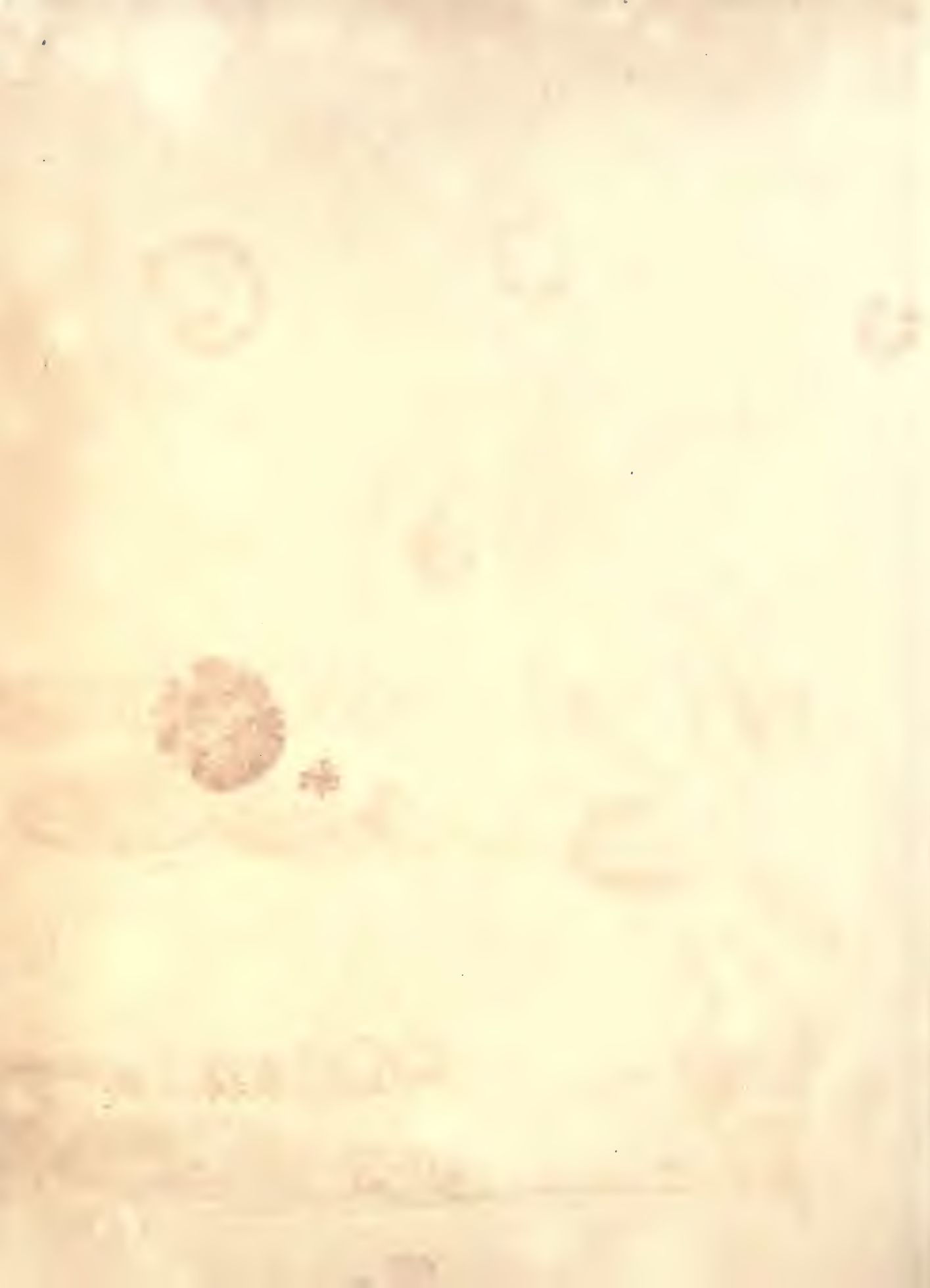


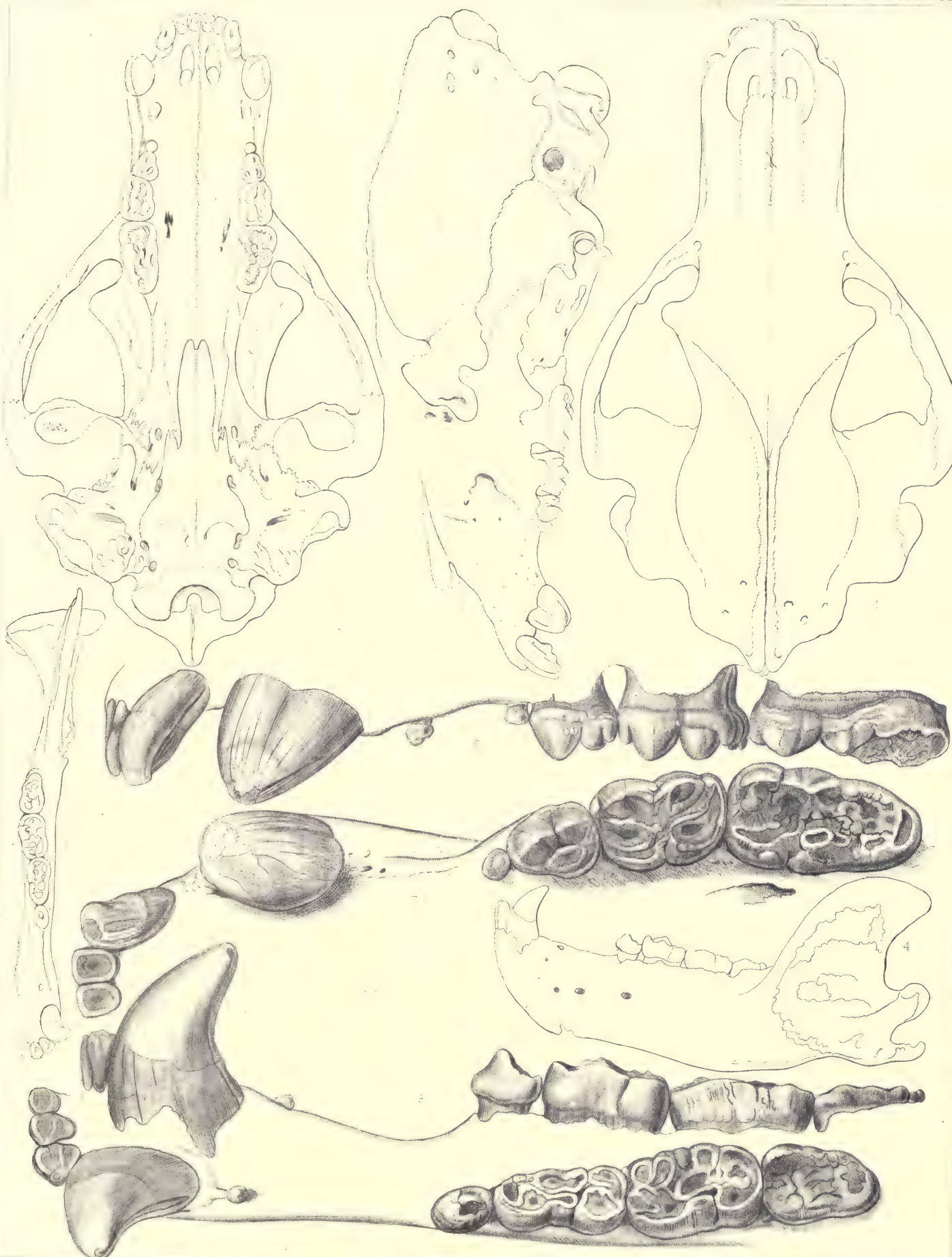






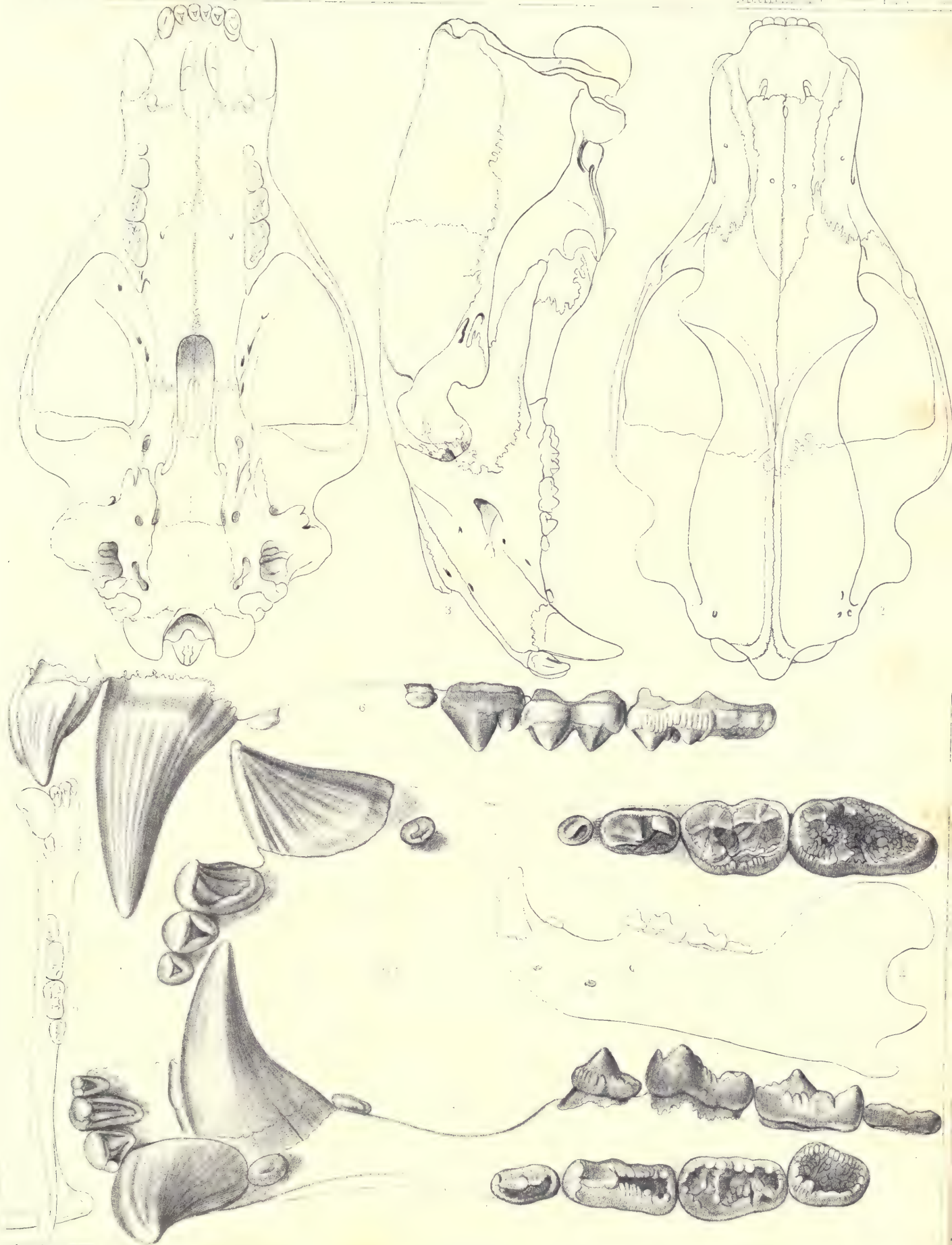
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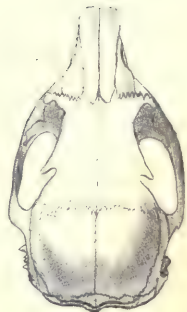
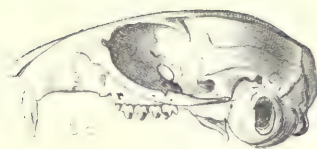
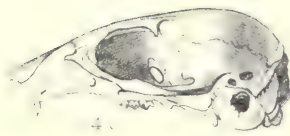






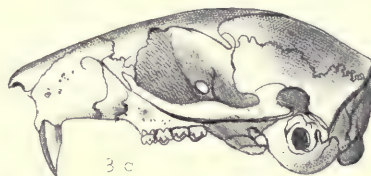
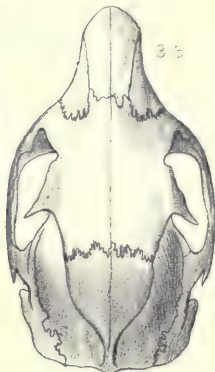
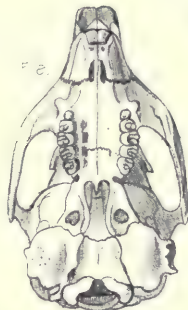
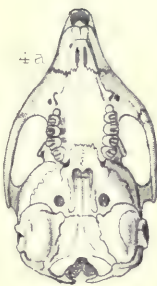
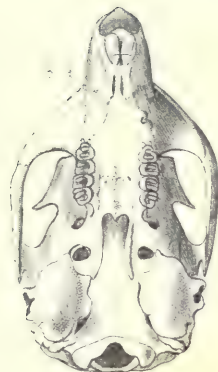






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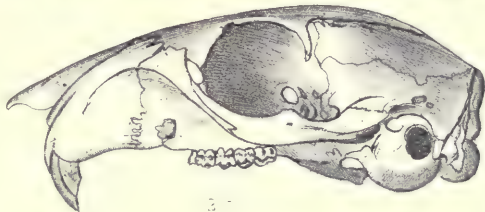
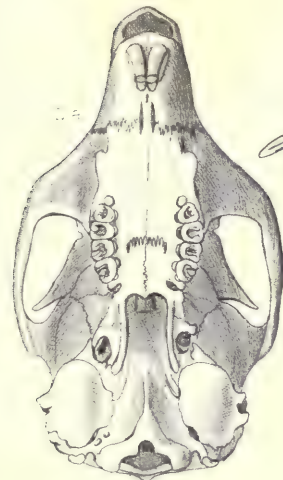


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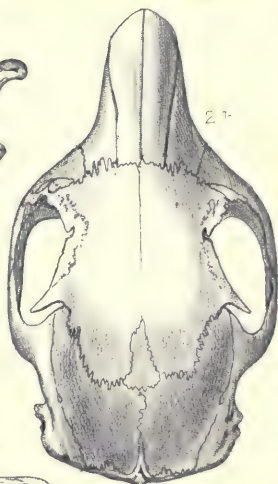
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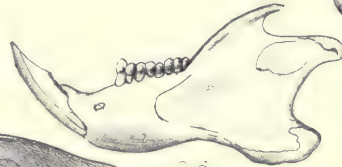
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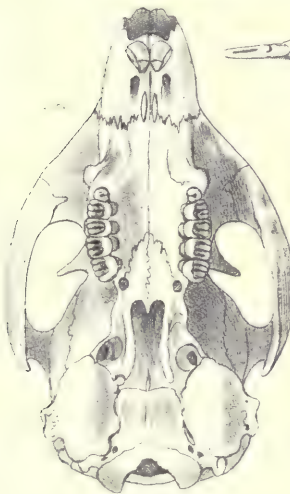
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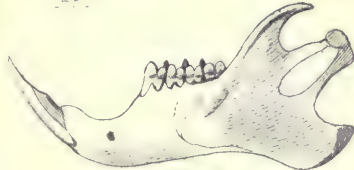
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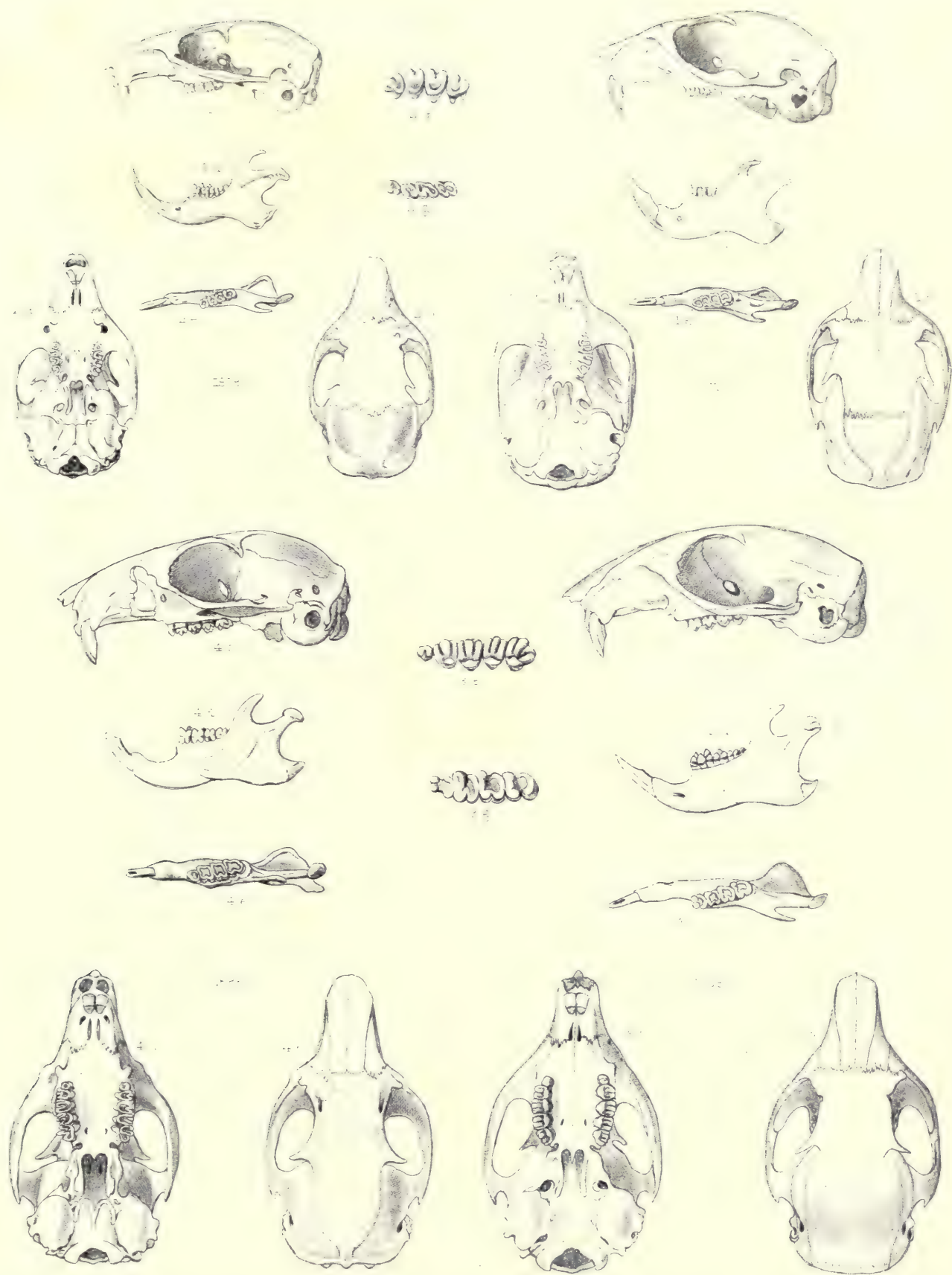


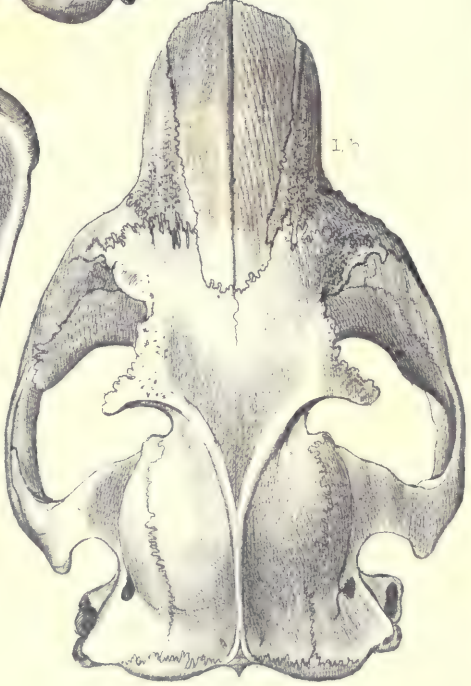
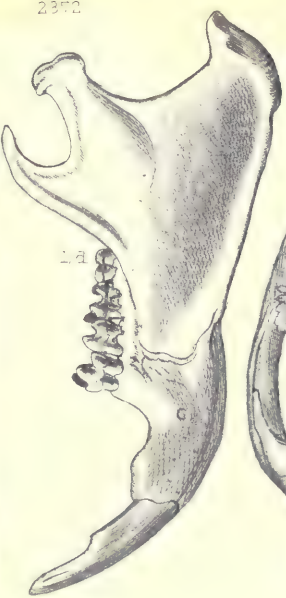
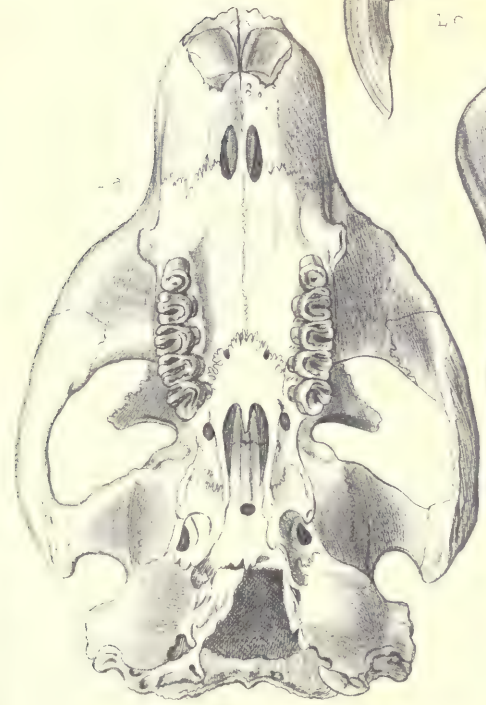
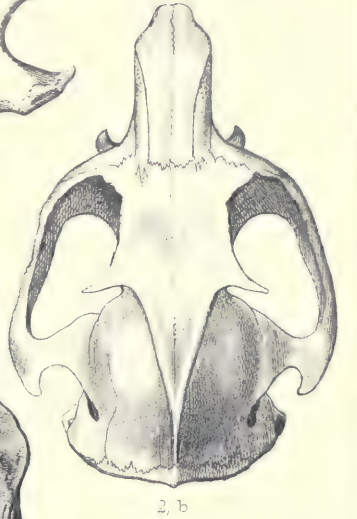
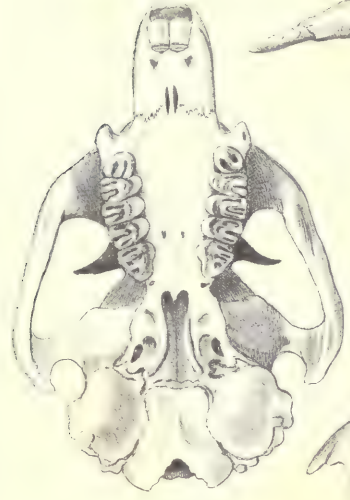
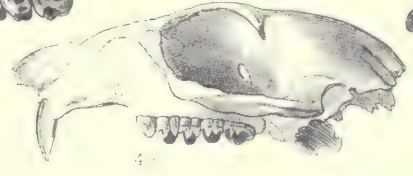
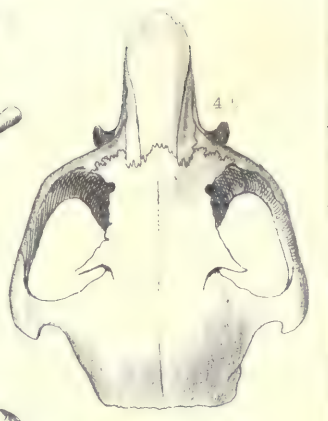
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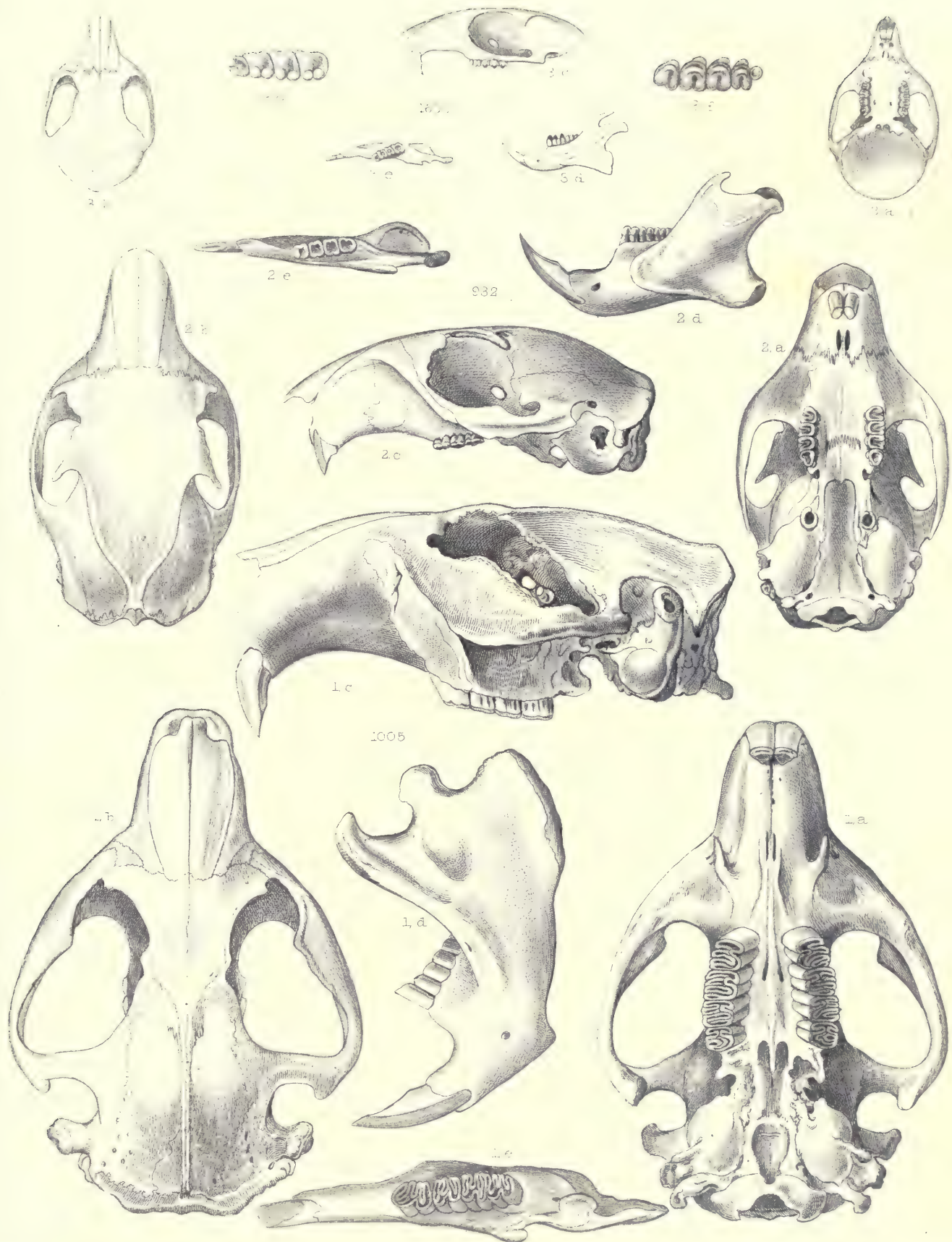


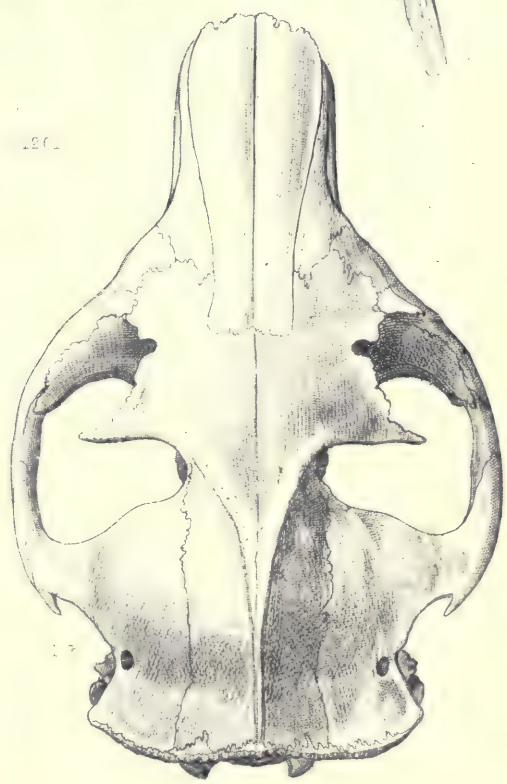
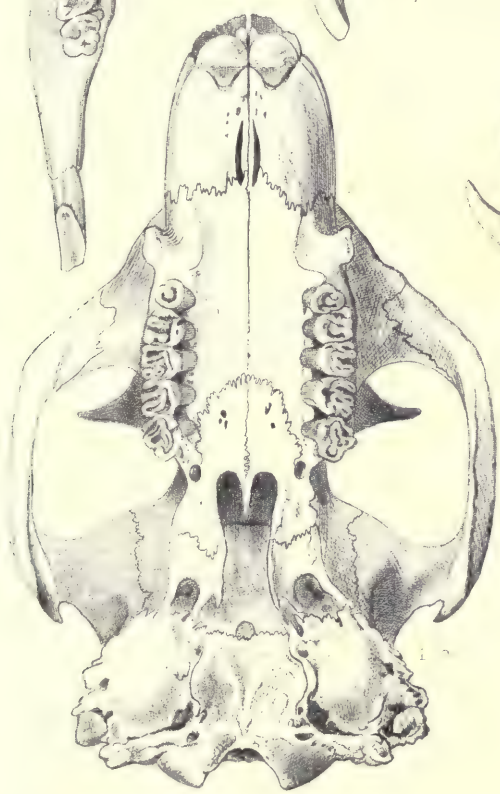
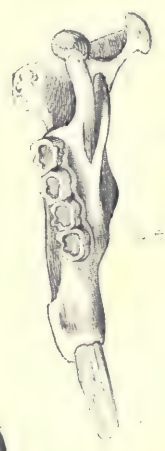
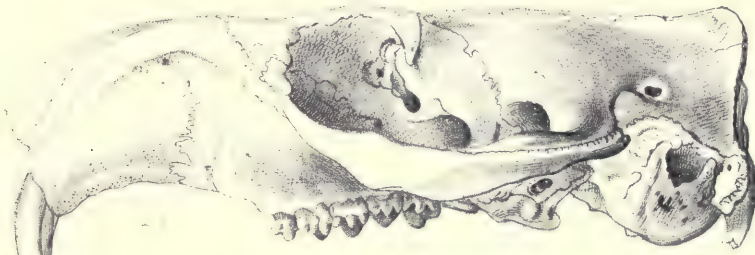
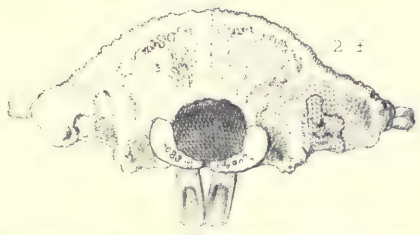
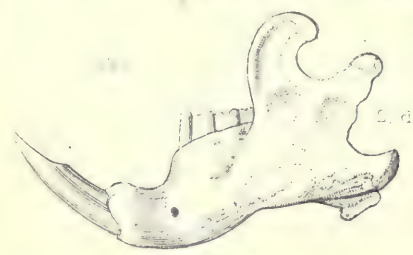
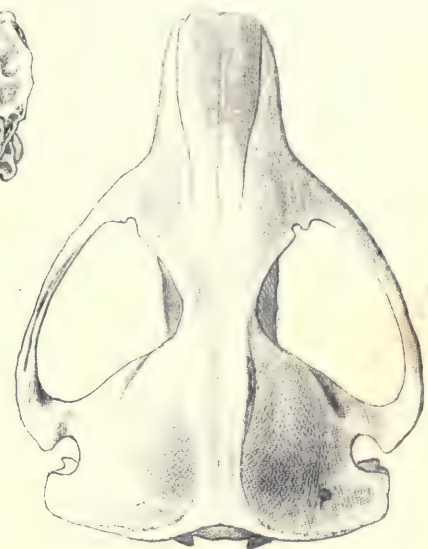
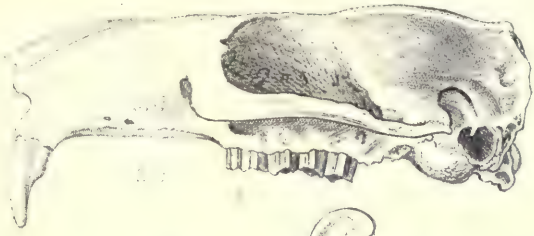
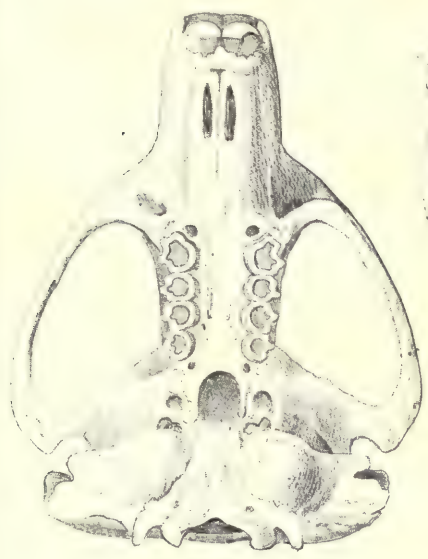
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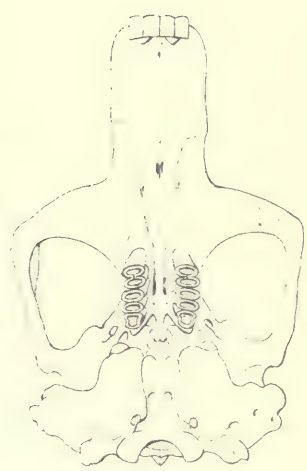
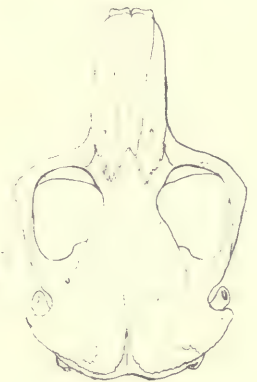
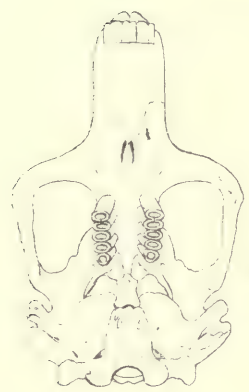
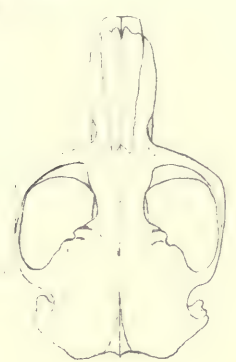
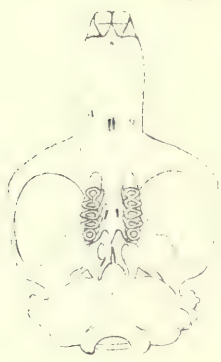


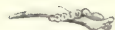




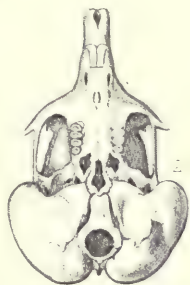




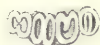




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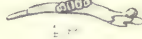
2.6



2.7



2.8



4.5

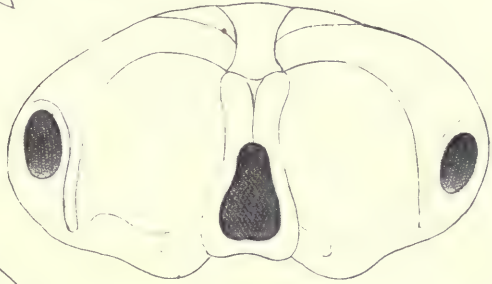


4.6

3.5



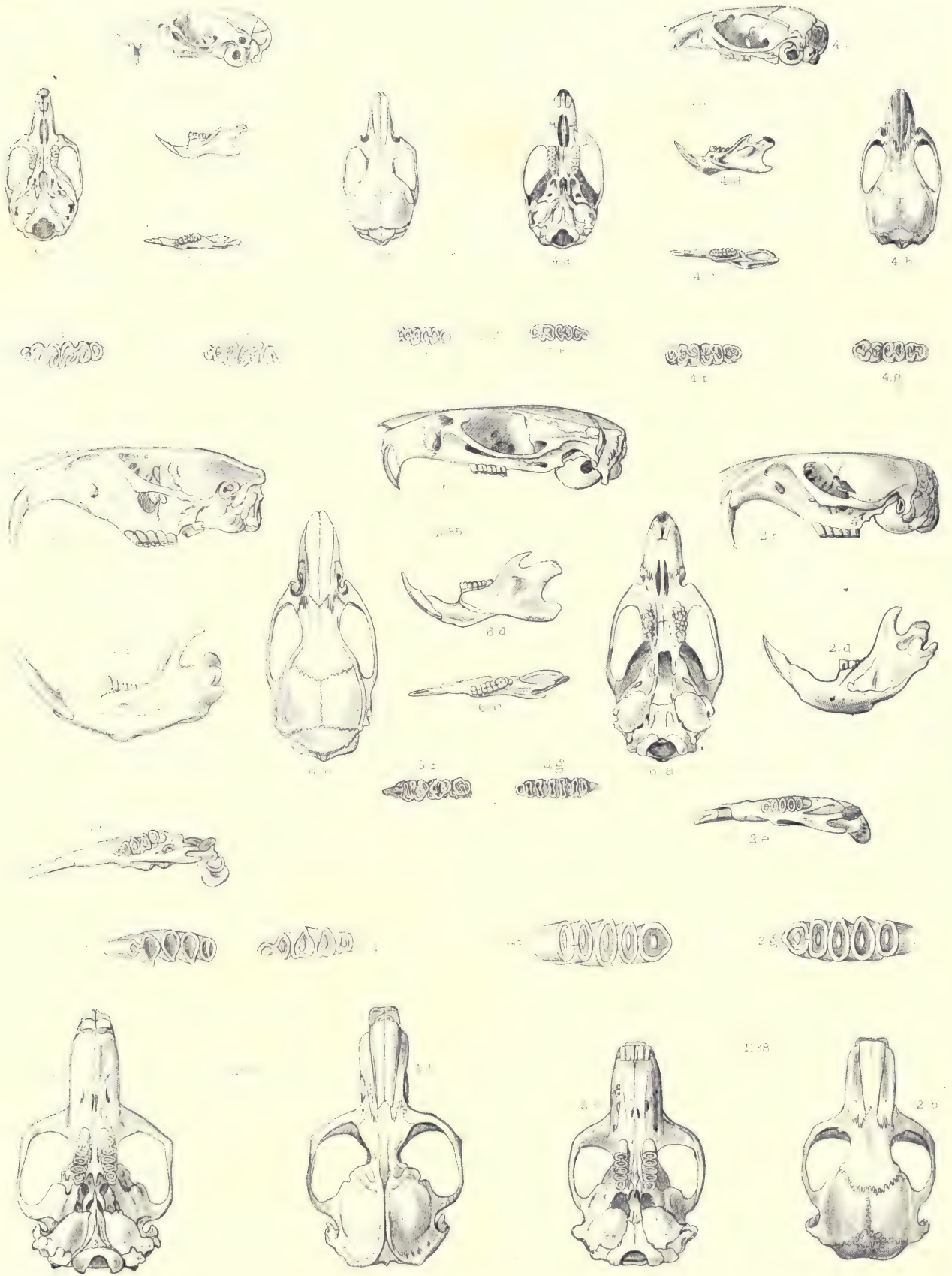
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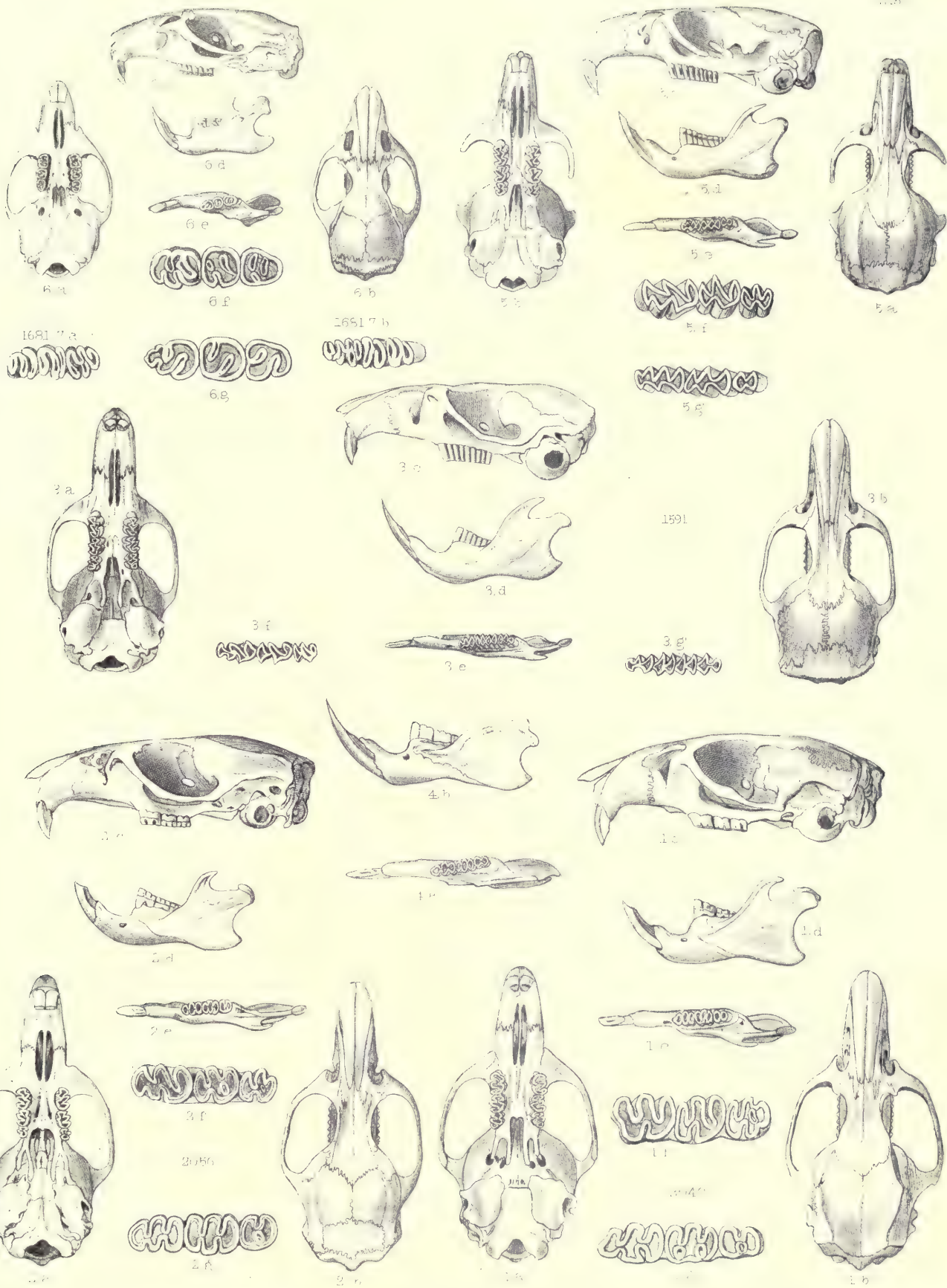


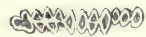
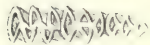
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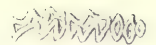
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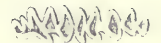




158"



1774



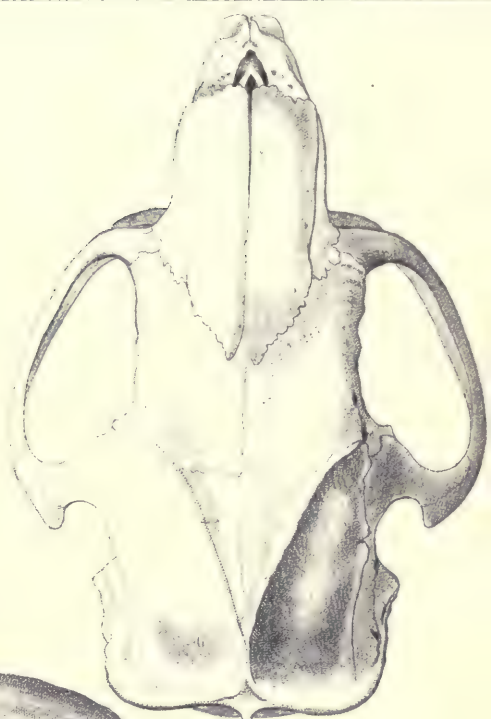
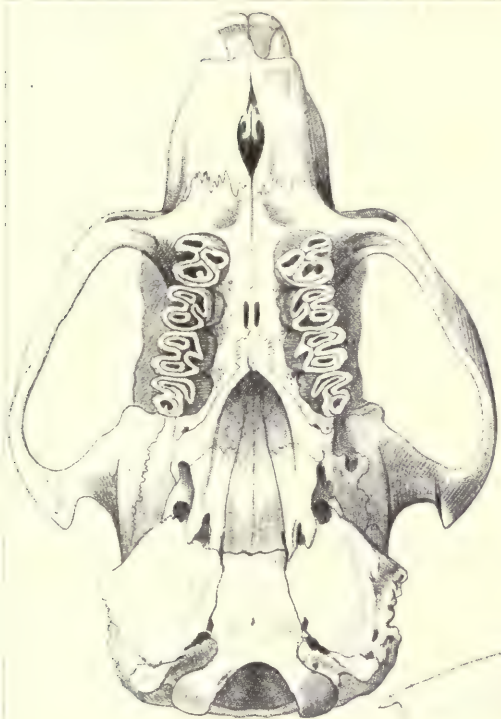
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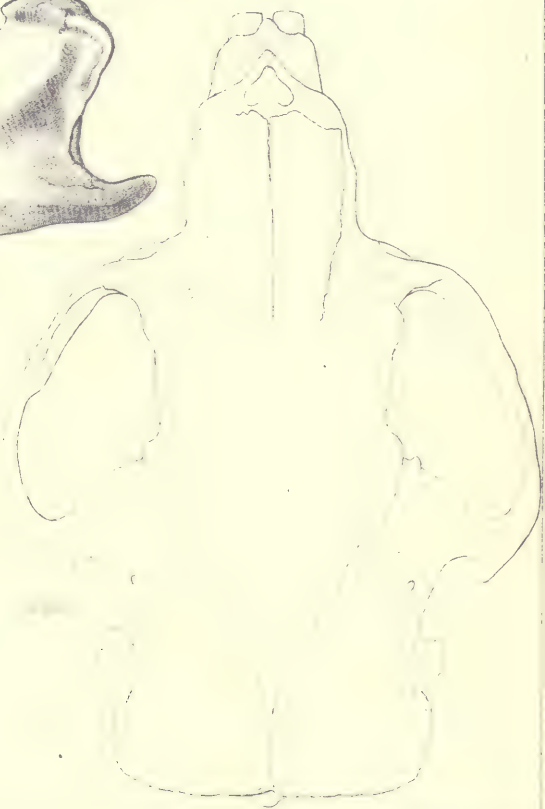
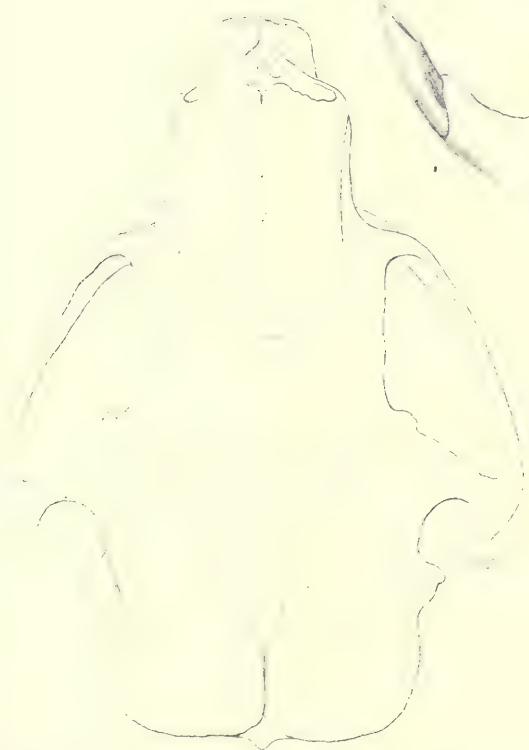
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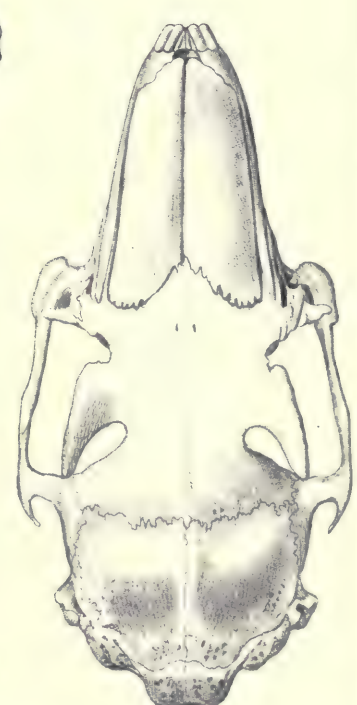
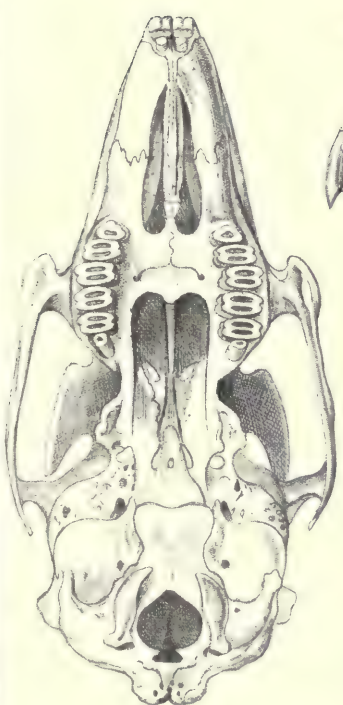
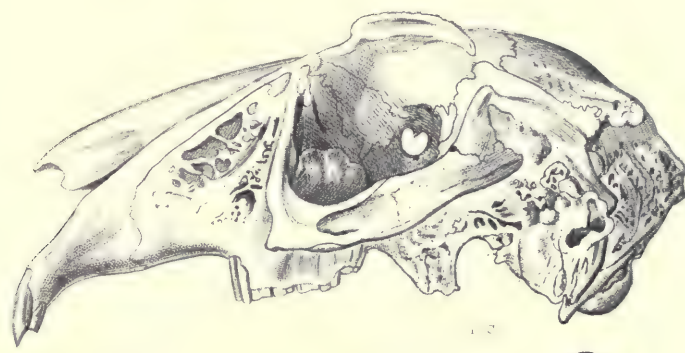
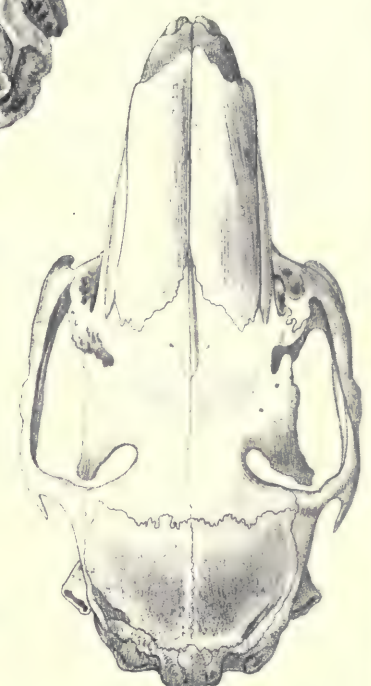
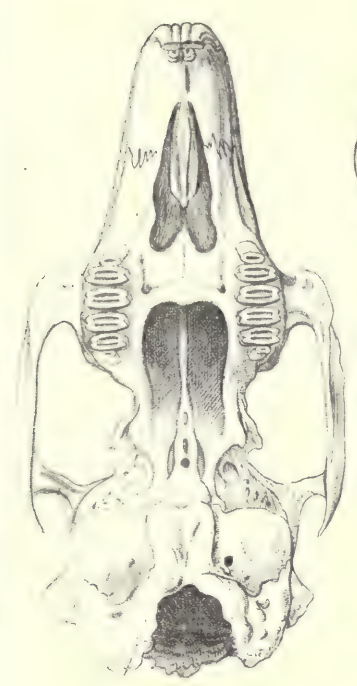
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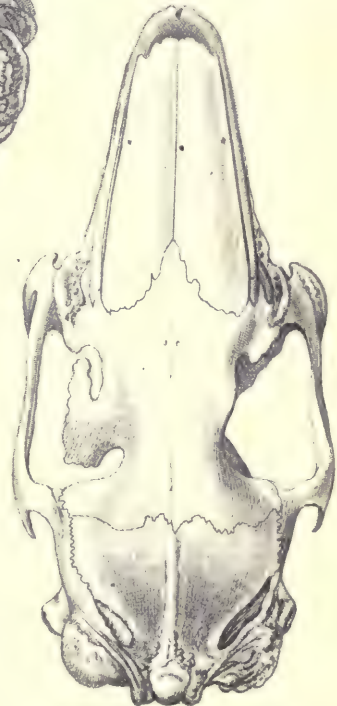
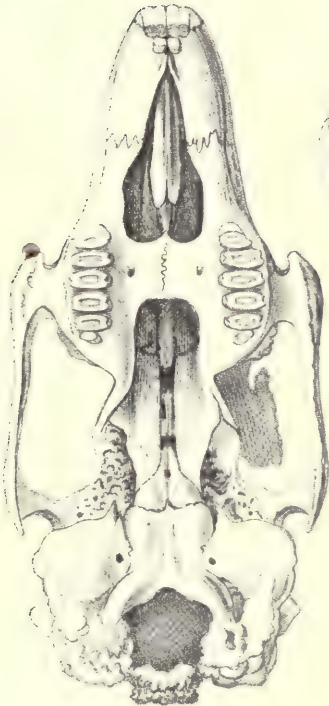
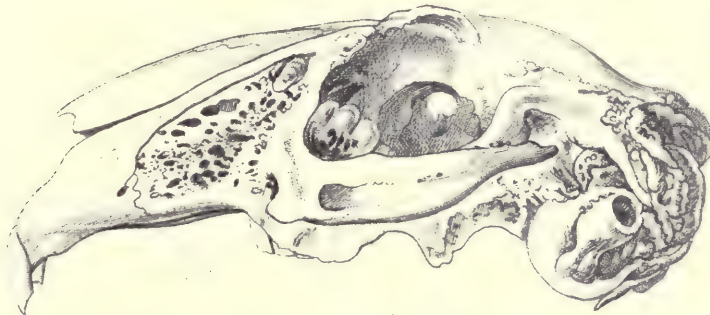
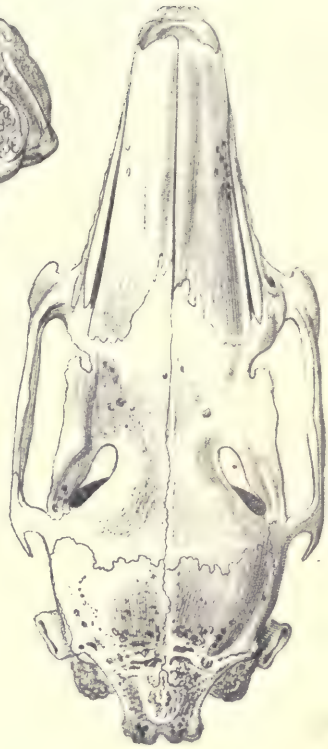
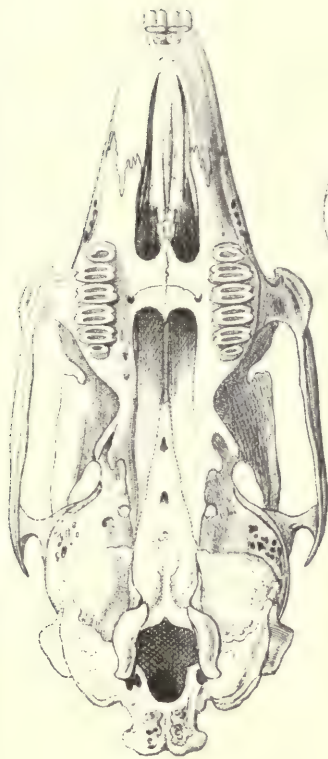


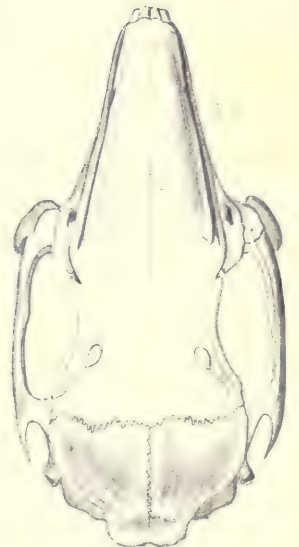
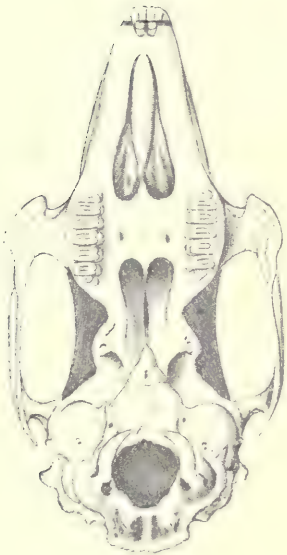
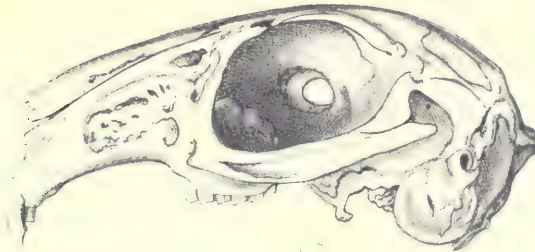
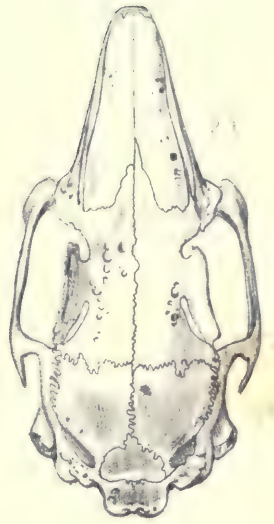
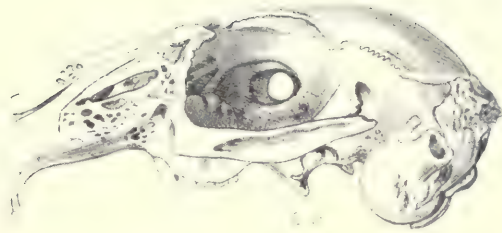
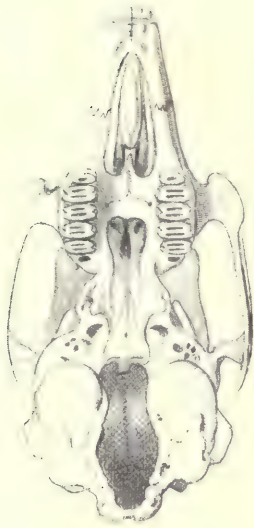


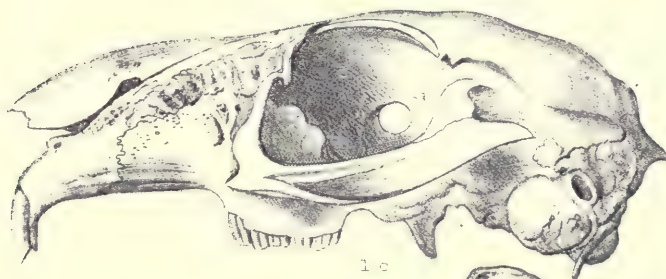
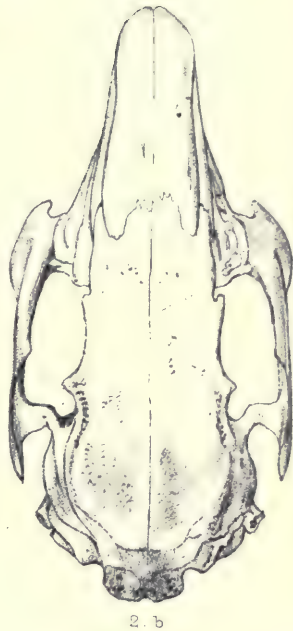
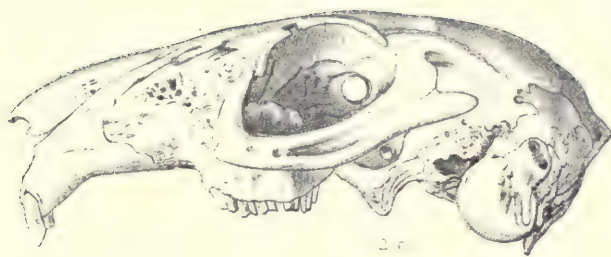
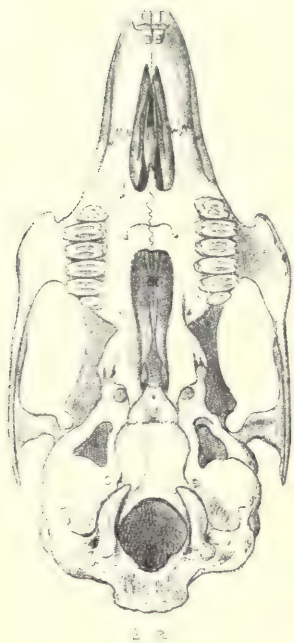
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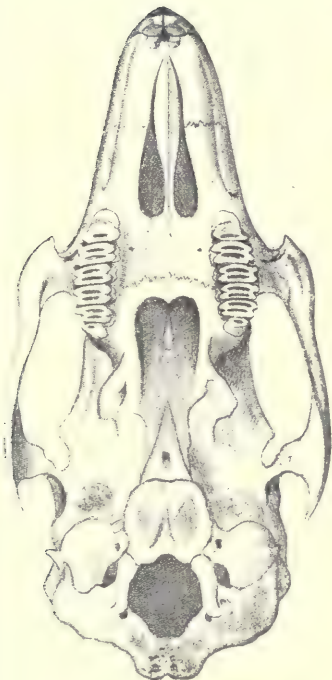
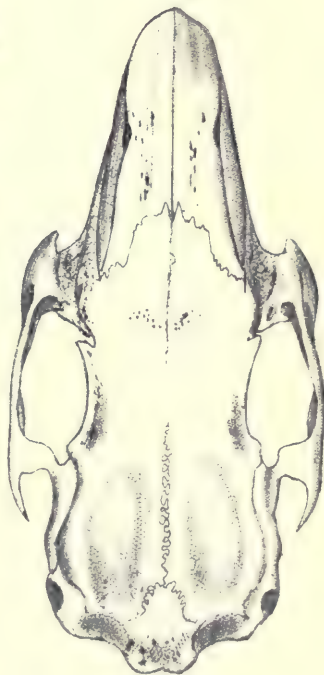
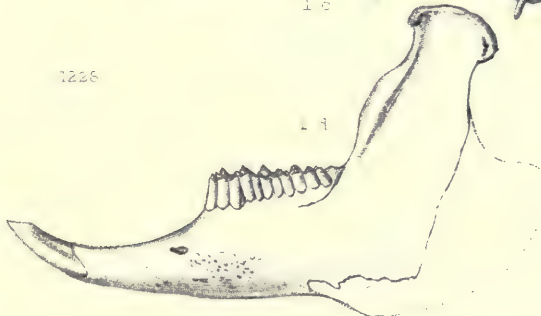








2226

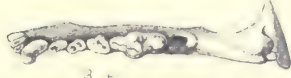




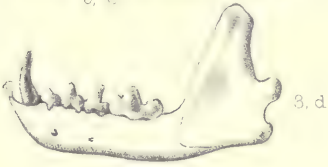
2. a



3. c



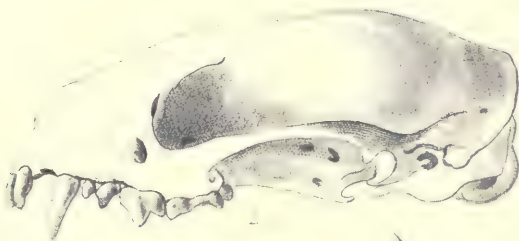
3. b



3. d



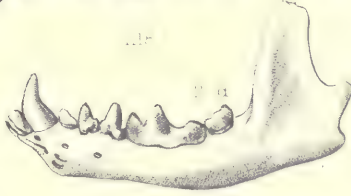
2. b



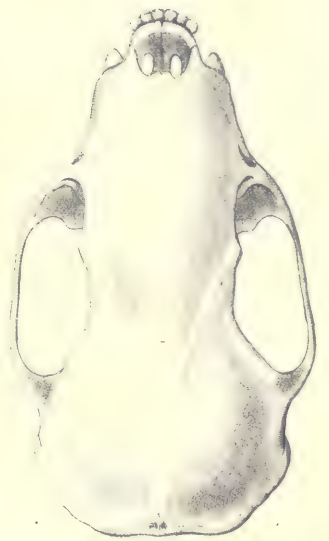
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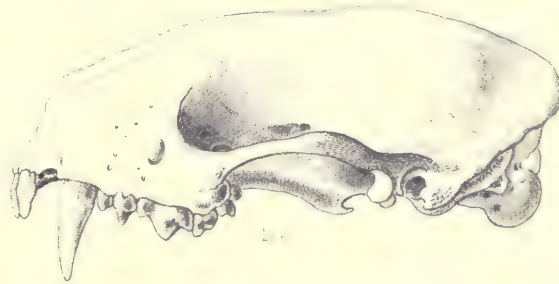
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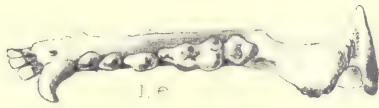
3. g



2. c



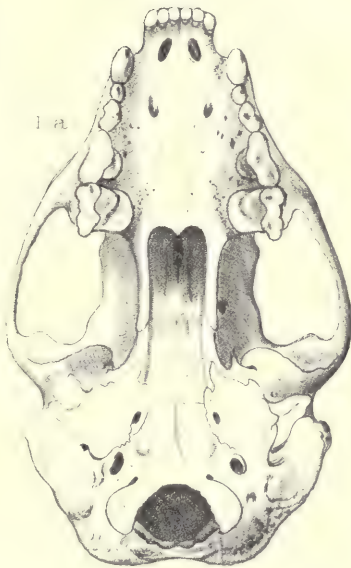
1. c



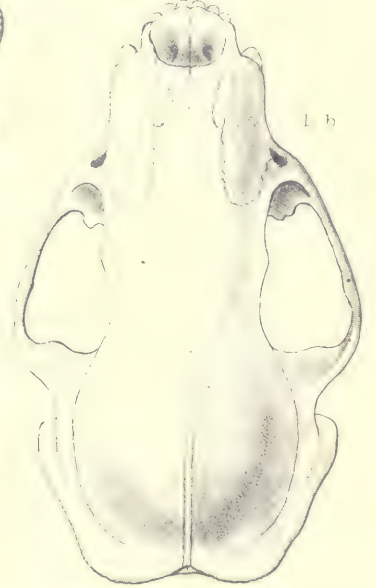
1. b



1. d



1. a



1. b

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